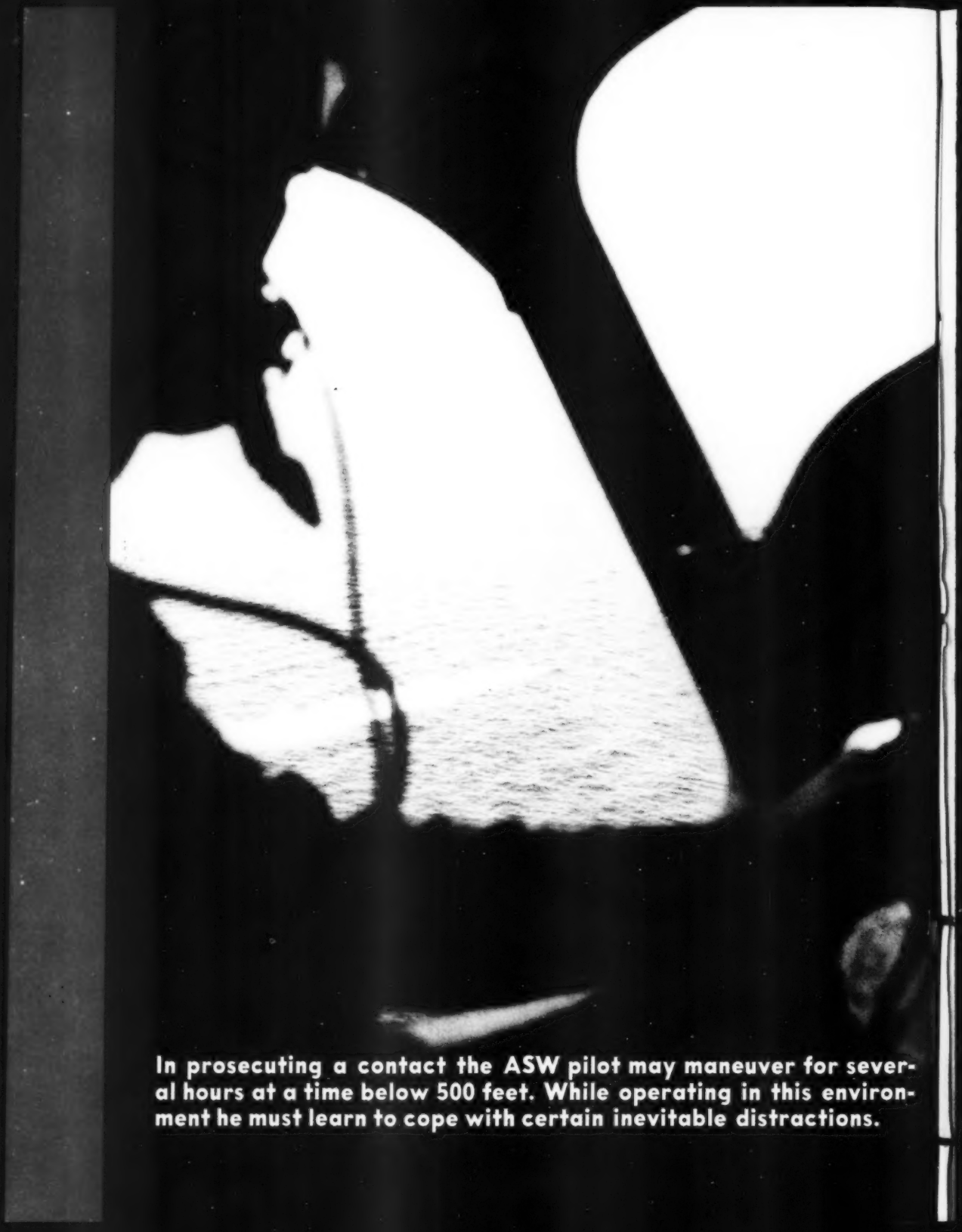
approach

August 1965 THE NAVAL AVIATION SAFETY REVIEW



In prosecuting a contact the ASW pilot may maneuver for several hours at a time below 500 feet. While operating in this environment he must learn to cope with certain inevitable distractions.

By LT J.B. Pugh

LOW AND SLOW

In the past seven years at least 16 aircraft (11 S-2s and five P-2s) have collided with the water during ASW or reconnaissance operations.

Only three of these managed to remain airborne and limp home with smashed tip tanks, crumpled wingtips or minus radomes.

MAD tactics were involved in over half of these mishaps . . . nine to be exact.

Four incidents took place during searchlight runs.

Training exercises were in progress on 13 occasions, two of which were being conducted as part of an ORI.

Some of the factors proposed as contributing to these mishaps may startle the novice in the low-and-slow business . . . but the experienced ASW pilot will be no stranger to many of them, having learned through the experiences of others or by encounters of his own.

In the typical case, either one or both of the pilots were distracted or preoccupied to some extent. For instance:

- Copilot writing down events in the ASW narrative or involved with equipment.
- Pilot checking switch positions on the ordnance panel.
- Pilot looking at copilot or another crewmember while answering a question or receiving information.
- Copilot trying to get a balky searchlight control handle to work.
- Instructor pilot explaining a maneuver to pilot while demonstrating it from the right seat.
- Pilot attempting part-contact flight in conditions where the horizon was ill-defined or nonexistent.

In the "other" category, vertigo, smokelight fixation and excess zeal (see September 1963 APPROACH article, "Cautious Tigers") are mentioned occasionally as contributing factors.

Did such factors really contribute to these accidents? Perhaps a closer examination of some of them, *in which one or both pilots survived*, will help you draw your own conclusion.

Instruction

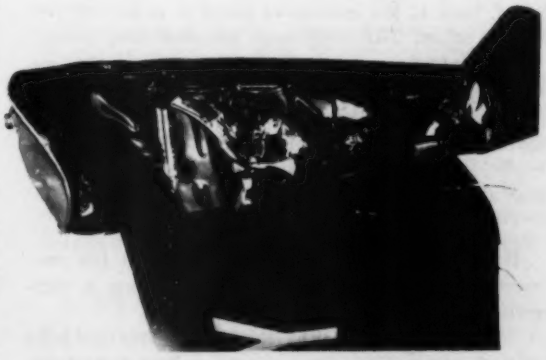
The pilot in control of a P-2 (flying right seat) was demonstrating MAD tactics to a couple of student pilots on a daylight training flight. One student sat in the left seat and the other occupied the plane captain's jump seat.

Following completion of a starboard cloverleaf MAD pattern a port turn was commenced. During the turn, while discussing the tactic just completed, the instructor pilot felt the aircraft descending and noted the pressure altimeter passing 100 feet.

As he recovered, the port wing tip tank struck the water.

The return flight and landing were uneventful.

"Regardless of other requirements imposed by the flight mission," states the Accident Board, "pilots must not lose sight of the need to fly the aircraft at



P-2 tip tank damaged by impact with the water.

all times in the safest possible manner." Several noteworthy recommendations were made:

- Use a higher-than-minimum maneuvering altitude when demonstrating and explaining low-level tactics.
- If you're to control the aircraft during low-level tactics, do it from the left seat, where the radar altimeter warning light is clearly visible.

Copilot's Questions

At the completion of a MADVec during a *night* training flight, the S-2 pilot pulled up to 400 feet and simultaneously rolled into a left turn. Unnoticed by either pilot, the aircraft's nose dropped during the turn and subsequently hit the water. The copilot had asked a question just prior to impact and the pilot had looked directly at him momentarily while answering the question.

"All pilots should be aware that the aircraft must be flown primarily by reference to instruments during low-altitude night ASW tactics," comments the Board. "Due to his concentration on the narrative, the copilot was unaware of the dangerous position of the aircraft and the impending accident." Although the copilot is responsible for maintaining a narrative of events during an ASW mission, these duties cannot completely overshadow his responsibility to monitor the flight instruments, particularly when the aircraft is maneuvering at low altitude.

No Drop

A few minutes after passing over datum (following commencement of a *night* ASW exercise) an S-2 flew into the water. The pilot describes that brief interval. "On reaching datum the appropriate ordnance was supposedly dropped and I began a 180° double standard rate turn. I rolled out to a standard rate turn when passing a heading of 320°, still maintaining 300 feet altitude. Then the copilot said, 'We didn't drop anything' and I glanced at the ordnance panel, back to the instrument panel to make sure we hadn't passed 270° (my next intended drop point) and then back again to the ordnance panel . . . we hit the water."

Once again the pilot's attention was temporarily diverted from his primary task of flying the aircraft . . . a momentary lapse that proved critical at low altitude.

Attention Grabber

Here is the copilot's account of the last few moments of another *night* ASW flight—during a competitive exercise.

"After entering the MAD hunting circle the pilot said over the ICS, 'I've got to get down,' at which time I checked both the radar and pressure altimeters at 700 feet. The pilot reduced power, disengaged the Automatic Flight Control System (AFCS) and commenced a descent. I believe that immediately after these events we obtained a contact. I began working with the Navigational Computer Display (ASN-30) . . . when the pilot said, 'Good, I see you even inserted it,' referring to some contact information provided by one of the crewmen. The next thing I knew the aircraft shuddered violently and all the lights went out.

"Up to this point I had not noticed any malfunction in any of the aircraft systems. I had previously checked both altimeters at 700 feet and 400 feet with no discrepancy between the two. The AFCS, which I believe was still disengaged, had been operating normally in all respects. At no time did I feel the aircraft enter any unusual maneuvers nor did I experience any unusual G-forces or disorientation."

There was no visible horizon on this particular night, making exclusive reliance upon instruments a necessity.

The Board made several interesting comments concerning the "attention-grabbing" aspects of the ASN-30. It said, "Supreme mental discipline is necessary on the part of the pilot flying the aircraft to resist the temptation to assist the Tactical Coordinator (copilot) in the prosecution of his problem.

"The first tour pilot (when in the left seat) often lacks the experience to realize how truly dangerous this situation is; and the older pilot, by virtue of his

Let the copilot run the tactical problem.

The objective in shipping surveillance is to obtain as much information as possible, consistent with weather and visibility conditions on the scene.

experience feels a strong compulsion to expedite the solution by monitoring the ASW problem as it progresses, as well as fly the aircraft."

The pilot in this mishap had considerable ASW experience prior to moving into a plane commander's slot. Possibly this background influenced him to disrupt his instrument scan to assist the copilot on the ASN-30.

The Board pointed out that pilots could develop unhealthy habit patterns during training sessions in the local S-2E cockpit trainer. The only functional flight instrument in the trainer is a Bearing Distance Heading Indicator (BDHI). When used properly this instrument can provide sufficient maneuvering information but there is still a tendency to use the ASN-30 display to assist in getting back over datum. This tendency could possibly carry over into actual flight operations.

Recommendations:

- Fly solely by reference to instruments when assured visual flight is not possible.
- Concentrate on flying the aircraft . . . let the copilot run the tactical problem and also act as outside visual observer.
- Make maximum effective use of the AFCS Altitude Hold Features at low altitude.

Contact Info

After identifying a contact, the S-2 pilot entered a starboard descending turn to position the aircraft for a photography run. Meanwhile, the copilot was setting up the camera. "At this time," states the report, "a crewman passed some information that the pilot thought would be of intelligence value concerning the contact.

"The pilot quickly jotted some of the information on his kneeboard. When he looked up the aircraft was low over the water and still in a shallow nose-low right turn. Immediate recovery action was applied but one bump was felt as the aircraft started climbing."

The damaged aircraft returned to the carrier and landed aboard successfully.

"Flying safely at low altitudes is not a simple matter," states the report. "Distraction of the pilot, whether from conversation, concentration on maneuver, concentration on contact information, mental stress, or sheer boredom, can bring disaster. When flying in VFR conditions, at least one pilot should always maintain a visual watch outside the aircraft."

ASW Narrative

A P-2 pilot was maintaining his position in a MAD trapping circle by reference to his flight instruments and a smoke light on a dark moonless

During VP low-level tactics the copilot is free to act as safety observer.

night. While he was looking outside momentarily to check his position in relation to the smoke light, the aircraft began descending and was passing through 100 feet before he detected the altitude loss, reacted to the danger and transitioned to wings-level climb. During the rollout the port wingtip tank plowed through a wave, sending a momentary buffet through the aircraft. Recovery was successful and the aircraft returned to base.

The *copilot* first became aware of the altitude loss (from 300 feet) as the aircraft passed through about 90 feet. During the descent he had been making entries in the ASW log (narrative).

In the opinion of the board, "the pilot overestimated his ability to fly the aircraft under *instrument* conditions while simultaneously maintaining orientation by visual reference outside the cockpit." Further, "the copilot should have been monitoring the flight instruments but was maintaining a narrative report which detracted from his primary duty as safety pilot."

One endorser described night MAD tactics as "a demanding task." He felt that these tactics "are an infringement of a basic flying principal in that the evolution is a combined visual/instrument affair." Continuing he said, "It is only by visual reference to a smoke light on the water or by referring to the DRT plotter that the pilot is able to determine his desired flight path, and once this flight path has been determined, he usually refers to his instruments to accomplish the required maneuvering."

Justifying its use, the inflight narrative was described as being "required in order that flights might be quickly and efficiently debriefed, and to correlate the sequence of events on each flight." Although it is commonly referred to as the copilot's narrative, "it is not the intent that the copilot only keep the log." The inflight narrative is a necessary requirement of ASW crews, and "the narrative duties will pass to other members of the crew (such as the navigator) when circumstances dictate that the copilot give his full attention to flight duties." Current VP practice is for the navigator to maintain the narrative, leaving the copilot relatively free to act as a safety pilot.

Stall

The copilot of an S-2 was practicing modified cloverleaf maneuvers from the left seat during a *day* ASW training hop. Not being completely satisfied with the smoothness of his efforts, he asked his plane commander to demonstrate two or three from the right seat.

"After completing several passes over datum using right-hand reversal turns," relates the pilot, "he (the PC) made some comment about not feeling comfortable flying from the right seat and making right-hand patterns."

On the third reversal turn the pilot felt a little uneasy because the airspeed seemed slower than normal. He doesn't remember checking the airspeed indicator at that time but remembers the altitude at

200 feet and the angle of bank at 40-45 degrees.

Continuing his description, the pilot states, "I felt the aircraft start to shudder and it tried to roll further right. The PC was fighting it with aileron and rudders when it suddenly whipped back to the left. At about this time he added power and I reached up and lowered the flaps. I think we hit the water in a left-wing-down attitude.

Witnesses said that the S-2 actually rolled violently back to the right a second time and struck the water in this attitude. The starboard wing broke off at an undetermined wing station upon impact and the *Stoof* cartwheeled into the water.

Upon recognizing the stall, the PC apparently made an instinctive decision to try to fly out of it. He was experienced in the S-2, and well-versed in stall recovery procedures, but may have momentarily forgotten that heavy use of opposite rudder during a stall recovery would increase the tendency to spin.

The PC was uncomfortable flying from the right seat making right-hand patterns.

The board felt that the PC's "lack of recent experience in controlling the S-2 from the right seat contributed materially to this accident."

Regardless of the contributing circumstances, the basic cause of this mishap was insufficient airspeed in a turn at low altitude . . . a problem about as old as aviation. Contributing was the pilot's hesitation to warn the PC or take control upon recognizing the development of a dangerous condition.

Wingover Turn Stall

While engaged in MADVecs during a *day* training flight, an S-2 called "MadMan" about 1600 yards off the controlling ship's port bow.

"I specifically recall," says the pilot, "that instead of making one continuous 180-degree turn, I initially made about a 90-degree turn to the left, following it with about a ten-second straightaway. This left the ship in my 11 o'clock position. I recommenced a slight left turn to pass over the ship, intending to depart from it toward the latest sonar contact, if one was available.

"I then looked out the side window to orient the turn and to see where the last smokes were, and suddenly realized the port wing was dropping. The horizon flitted out of my view."

The pilot recalled his altitude at this time to be about 250-300 feet and airspeed close to 140 knots.

"Without looking at the instruments, I applied full right aileron and simultaneously pulled back on the yoke. The nose had dropped sharply by now and the ship was no longer visible through the front window."

"From the time of wing drop to impact with the water was about 4-5 seconds," continues the pilot. "I endeavored to regain control or at least to get the wings level during those fleeting moments but felt no response to the controls at all. We had to just sit it out. The aircraft shuddered just before impact."

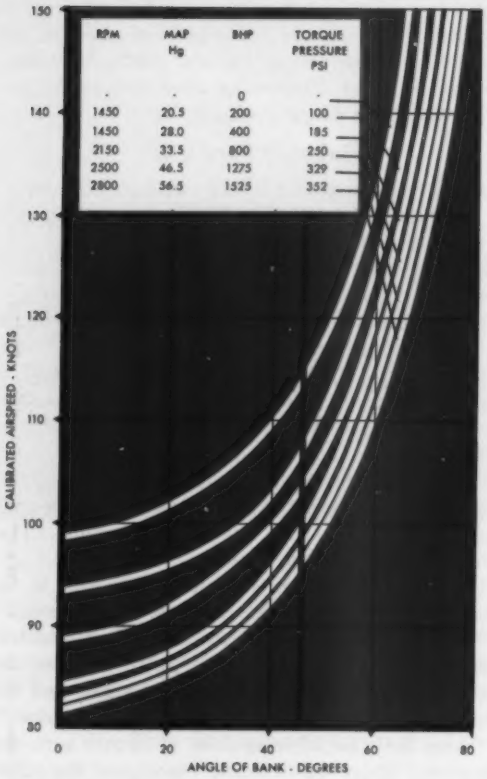
"The cloverleaf MAD pattern is normally flown at a 45-degree angle of bank in the steepest part of the turn, at a nearly constant altitude in the turn," stated the Board, "and with enough power to maintain 140-145 knots.

"Even under these relatively safe conditions," it continued, "a great deal of conscious effort is required to keep the angle of bank from increasing, and to maintain altitude by keeping the nose above the horizon.

"If the bank should increase, more and more back pressure on the yoke is required to maintain altitude, and positive G-forces increase as the yoke pressure increases."

For the following reasons, it seemed unlikely to the board that the stall occurred in a level turn:

- The power setting of 29″ MAP and 2100 rpm was sufficient to maintain level flight above stall speed in a level turn at a 45-degree angle of bank.



S-2 aerodynamic facts of life . . . 45 degrees is maximum angle of bank in the cloverleaf pattern.

• None of the survivors, including the pilot, recalled G-forces just prior to impact as would have been probable had the aircraft exceeded a 45-degree bank and subsequently stalled.

• A level turn at minimum altitude requires a great deal of concentration, and it is unlikely that a pilot would suddenly find himself in an excessive bank under these conditions.

The statement of the pilot and witnesses led the board to conclude that the stall actually occurred at the top of a wingover-type turn at about 400 feet of altitude and 60 to 70 degrees of bank. One of two situations were believed to have preceded the stall:

• Upon approaching the high point in the turn, the airspeed slowed to stalling speed for the angle of bank being maintained, or

• While in the turn, the angle of bank was abruptly increased, raising the stall speed up to or above the IAS of the aircraft. The latter situation was believed to have been more likely, because a gradual loss of airspeed would probably have been detected by the copilot in time to avert the mishap.

Slipstream may have caused a sudden increase in bank because another aircraft was nearby in the same pattern. Existing wind strength and direction relative to the pattern at that time lend credence to this possibility.

The pilot's response to the sudden excessive wing-low condition indicates that he may have analyzed his emergency situation as an unusual attitude rather than a stalled condition. This could explain his use of nose-up elevator during the unsuccessful attempt to recover.

Supervisory personnel were thought to be contributing in that "use of the stall warning system was not required." ASC-310 significantly improved the reliability of this system. "Had the significance of ASC-310 been made known to the pilots," continued the board, "and the use of the stall warning system required at all times during flight, the pilot may have had sufficient warning of the impending stall."

Recommendations:

• Emphasize stall characteristics of the S-2 aircraft, including stalling speeds at various angles of bank and power settings.

• Practice approaches to stalls frequently.

• Fly level turns in the cloverleaf pattern.

• Use the Artificial Stall Warning System at all times on all flights.

One endorser felt that practicing approaches to stalls was beneficial but recommended going further. "The S-2 can be partially stalled safely and an adequate level of training requires that the stall progress at least to the point of airframe buffet or slight roll-off," he stated, and went on to recommend a NATOPS change to this effect.

Current standard operating procedures require termination of the approach to a stall at the first indication of any of the following:

• Activation of stall warning system
• Airframe buffet
• Loss of altitude (mushing)
• 80 knots IAS

Differences of opinion regarding the best way to fly turns in the cloverleaf pattern were evident in the endorsers' statements.

One endorser commented that "Many experienced ASW pilots, in periods of good visibility perform a maneuver similar to a very mild wingover by pulling the nose slightly above the horizon after passing datum, climbing several hundred feet at the far end of the turn, and again descending to minimum alti-

Considerable disagreement existed among the endorsers as to the use of a wingover type turn in the cloverleaf.

tude for a wings-level straightaway before passing back over datum." He felt that this maneuver was safer than a 270-degree level turn at minimum altitude and was actually more effective in the case of single-plane tracking "since passes can be made over datum area at shorter intervals of time."

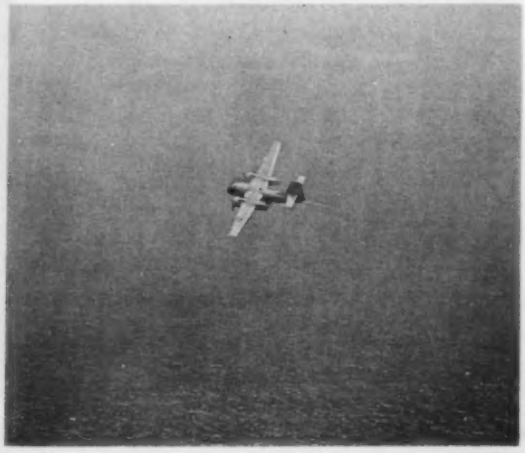
An advantage of the level turn at minimum altitude is the better detection capability of the MAD equipment.

Another endorser conceded this advantage but commented that "The amount of concentration on instruments required to fly a 45-degree bank at a constant minimum altitude is not considered to be compatible with the degree of concentration *also* required outside the cockpit." He preferred "a mild wingover turn with about 200 feet altitude at the top," believing this to be much safer for *day* MAD tracking.

Finally, a third endorser advocated level turns at minimum altitude in the cloverleaf pattern. He felt that this was the most efficient and the safest way to perform the maneuver. He agreed that "this pattern requires precise flying with considerable concentration inside the cockpit by both the pilot and copilot," but felt that "the added detection capability of the equipment should offset any slight degradation to the pattern integrity which might result." He believed that adherence to a level-altitude turn would have precluded "a situation such as occurred in this accident where airspeed was traded for altitude and a nose-high wrapped-up turn resulted in a stalled condition."

Standard operating procedures advocate level turns in the cloverleaf pattern.

Avoid wingover type turns in the cloverleaf pattern . . . NATOPS.



Illuminate

Upon arriving on station during an operational mission, the P-2 began a box type search pattern at 3000 feet under the positive control of a surface unit.

Some time later the controller directed the P-2 to investigate a surface target about 15 miles to the southwest.

By making a low pass over the target the PPC identified it as a well-lighted merchant ship, and after informing the controller, asked him if he needed further identification. The controller replied "affirmative" and granted permission to illuminate the vessel.

Several items were missed on the first searchlight run and the plane proceeded outbound for about two miles to begin reversing course for another pass. The reversal turn was conducted above 500 feet according to the pilot's pressure altimeter.

Initial impact with the water occurred shortly after rolling out of the turn. Several additional bumps were felt before the aircraft settled to a stop in the water.

The aircraft was being controlled by the third pilot (PP3P) from the left seat. He had rolled into a left standard rate turn about two miles beyond the

The warning light flashed ON 3-4 seconds before impact.

merchantman after the first pass and had maintained primary reference to instruments during this turn until the ship came into view. Rolling wings level, he started down to 200 feet using the pressure altimeter as a primary altitude reference. Impact came a few seconds later.

The plane commander was occupying the right seat. He had turned his attention to the TacAid after observing the aircraft to be in a normal climbing left turn following the first searchlight run. Nearing completion of the turn he again looked outside the cockpit, attempting to relocate the merchantman.

Neither pressure altimeter in the cockpit was set at the local barometric pressure, although the controlling ship could have provided the current setting had it been requested. The pilot's altimeter was set at 29.92, while the copilot's was set at 29.83, the barometric pressure at the point of departure. The local barometric pressure at the time of the accident was 29.69, which meant that the aircraft's actual altitude was about 140 feet below the indicated altitude on the copilot's pressure altimeter, and 230 feet below the altitude indicated on the pilot's pressure altimeter.

The radio altimeter (APN-1) warning light was set to come on at 200 feet, and according to the pilot it had indicated within 50 feet (on the low side) of his pressure altimeter altitude during the low-level maneuvering prior to the mishap. Since the aircraft's actual altitude was 230 feet below that indicated on the pilot's pressure altimeter, due to an incorrect setting, it was believed that the APN-1 had an inflight negative calibration error of 180 feet (230 less 50) on the low scale.

"With the APN-1 warning light set at 200 feet and with an inflight calibration error of 180 feet negative, the aircraft could reach an altitude above the water of 20 feet before the warning light would come ON," commented the Board, and it pointed out further that "the low scale reading on the radio altimeter will not actuate the warning light until it agrees with the setting established by the pilot."

This analysis is supported by the fact that the warning light flashed ON (observed by the PPC) 3 to 4 seconds before impact. In that brief interval, the PPC grabbed the yoke and took control but the aircraft's downward momentum quickly carried it through the remaining 20 feet into the water.

Several other factors deserve attention:

- The aircraft was flown below TacAid night minimum altitude of 300 feet and squadron night minimum altitude of 400 feet.
- The APN-1 low altitude limit switch (set at 200 feet) was not used to preclude breaking either of these minimum altitudes.
- TacAid specifications for a searchlight run (three-mile straightaway) were not observed.
- The flight instruments were not continuously monitored by the copilot during low altitude maneuvering.

The Accident Board recommends that "the dangers inherent to flying half on instruments and half visually be reemphasized."

One endorser considered that the primary cause factor was the use of an unqualified copilot to con-

The plane commander will have to divide his attention to some extent in order to keep pace with the problem.

trol the aircraft. He questioned the PPC's decision "to allow a relatively junior pilot (PP3P) to control the aircraft while conducting low-level night operations," particularly since (this) pilot had never previously conducted a searchlight run." "While junior pilot training is a necessity, the time, area and conditions are important," stated this endorser, "and none of these were satisfied by the conditions of this flight."

Another endorser stated that, "To completely rig a ship at night is practically impossible, and to attempt to obtain detail using the searchlight is a most dangerous and unsafe maneuver." He pointed out that the decision to accept or reject such a request "rests squarely on the PPC," who "erred in not advising the controller of the extreme danger involved and requesting verification of the operational urgency for such information."

Complete rigging of ships is sometimes difficult in daytime and is not considered advisable at night. The PPC's decision to try to accommodate the controller rather than refusing his request set the stage for the mishap that followed.

In each of the nine mishaps discussed above the following factors were apparent:

- The pilot in control was distracted away from his flight instruments to the point where disaster was unavoidable.
- Adherence to standard operating procedures was not complete.

A fact of ASW flying is that the pilot in control of the aircraft will be distracted from time to time during a tactical problem even while maneuvering continuously at minimum altitudes. He simply cannot rivet his attention on the flight instruments exclusively and still keep pace with the problem.

ASW aircraft are expected eventually to be retrofitted with an aural low-altitude warning system. This development may be at least a partial answer, but the ASW pilot will still have to remain aware of the possible consequences of distractions at low altitude if mishaps of this type are to be avoided.

At some time or another 'most every ASW pilot will use excessive bank in a turn, get too slow or go below minimum altitudes during the prosecution of a contact. Such violations of standard operating procedures are usually unintentional; however, they do pose a threat to the successful conclusion of the mission and every effort should be made to avoid repetition. These procedures have been developed by experienced, highly motivated and competent individuals who have based many of their conclusions upon lessons from the past . . . usually learned the hard way.

Most of these mishaps occurred during training flights. In some cases, the weather conditions were less than ideal. Sending training flights out during poor flying conditions can be avoided. However, when one considers that the ASW pilot is frequently required to fly round-the-clock operational missions in *all* kinds of weather, it isn't unrealistic to expect that part of his training environment at least approximate what he will eventually encounter on an operational flight.

Extended low-level ASW flying is one of the most demanding, in terms of both skill and endurance, to be found in the Navy today. Deployed and shore-based squadrons operate for all practical purposes on a wartime basis, tracking contacts doggedly until they are surfaced or hounded out of the area. Steady improvement in equipment continues to lighten the burden, but the ASW crewman, with his aching, burning eyes, numbed posterior and noise-deadened senses is still the vital link in the ASW chain of success . . . and he will continue to remain so during the foreseeable future.

The job is not without pitfalls, but the fact that it can be accomplished on a consistent basis without mishap is proven by the successful conclusions of numerous missions each day.

TEN CAN SAVE YOU ONE

By R.J. Scoles

Chief Test Pilot, General Electric Company

In this article Dick Scoles emphasizes the importance of understanding not only the engine instrument presentations and knowledge of emergency procedures but the correlation between what the instruments are trying to tell the pilot and the "why" of the procedures employed.

Not so long ago, in the early jet days, it was not uncommon to hear, "I don't know what all those instruments mean, all I know is that when you push the go-handle forward, you go; when you pull it back, you slow down!"

Times, jet engines, and even pilots, have changed a great deal in the ensuing years. As engine technology has increased, so has the need for improved engine instrument presentation. The purpose of this write-up is to let the *Phantom* drivers know what all these engine gages can tell you. There is no intent to make every pilot a test pilot, nor do we advocate airborne troubleshooting after a malfunction. The intent is to teach the pilot to distinguish between normal and abnormal operation, to recognize his malfunction, and to understand "why" when applying corrective procedures.

How many squawks have been recorded of RPM droop at altitude, which is merely normal T_2 cutback? How many of you have wondered why the RPM backs down before increasing when slowly advancing the throttle from idle at altitude? How many times in twin-jet aircraft has the pilot reported double flameout, then continued to talk on the radios, whereas, if both engines were actually flamed out, radios would be unavailable.

In most cases, more than one instrument must be observed to tell a complete story. Such is the occasional occurrence of engine shutdown because the nozzles *indicate* full open at military power and yet Exhaust Gas Temperature (EGT) is indicating correctly. Then the classic of them all—a pilot and his RIO punched out when, in the soup, the airspeed indicator dropped to *zero*.

A good understanding of engine instrument presentation, knowing what they are trying to tell you, and a good knowledge of emergency procedures along with the knowing "why" the procedures are what they are, are a definite must for every pilot's brain kit. Simple memorization is not enough for a couple of reasons, the most important of which is that under stress or strain sometimes one seems to forget all he has memorized. But with a good training of "why," followed by some logical reasoning—then "flash," back comes the proper thinking. A good (?) example of memorizing alone occurred not long ago in a single-engine *Century* series fighter.

At 20,000 feet the fire warning light illuminated.

Continued

Corrective action should not be initiated on the readings of one instrument alone.

What is your primary instrument for inflight engine analysis?

The pilot called out, "I have a fire warning light!" His wingman radioed to pull the throttle to idle. This he did and that's all. He continually lost altitude, made no other *movement* (questionable), and eventually, as the accident report so vividly described, collided with the ground—Scratch one pilot and one airplane. This pilot had memorized his procedures (squadron doctrine), but was unable to reason or react once he had forgotten them.

Let's look at the F-4B/J79 instruments and see what some of the things are that they can tell us.

Exhaust Gas Temperature

The EGT gages are the pilot's primary instruments for in-flight engine analysis. The other instruments are secondary or supporting instruments, which can be used to substantiate a given EGT. Always check EGT first, but corrective action should not be initiated on the readings of one instrument alone. For instance, RPM unwinds rapidly, both during compressor stall and during a flameout; only the fact that EGT is high in the case of the stall and low in the case of the flameout, can allow the pilot to differentiate between the two. Similarly, the nozzle can be wide open both in case of stall and nozzle open failure. Again, EGT, which is high during stall and low during nozzle open failure, lets the pilot identify his problem.

Therefore, always check EGT first, then consult the other gages. You should also recognize the normal deviations, such as during conditions of low CIT, military EGT is low. Also, in high altitude work, engines can "run out of nozzle" in full afterburner, resulting in a higher than normal EGT. Under certain conditions this is to be expected and must be corrected by retarding the throttle slightly until EGT once again is within limits.

By understanding the EGT system and the effects that the nozzle has upon it, you are best prepared to distinguish rapidly between nozzle failures and compressor stalls, flameouts, and even idle descents. During idle descents from high altitudes you should recognize that the EGT reaches its minimum around 28,000 feet and can read less than 100°C. While testing fuel controls with low min flows, we have seen indications below 50°C, and the engine is still operating. Conversely on zoom flights to extremely high altitudes, minimum flow is enough to produce EGTs in excess of 900°C. Naturally, the engine should be shut down before normal limits are exceeded.

Once again, check EGT first, then verify or substantiate by cross-checking with the other gages.

Tachometer

An understanding of RPM and its variation of idiosyncracies can be a great aid to your mental composure during those trying times. Everyone recognizes the military RPM (and EGT) decrease during cold CIT conditions (called T_2 cutback), and everyone probably recognizes the drive-down ever present to some degree during afterburner lights. Do you, though, know what happens to RPM when the nozzle fails shut in afterburner, or what RPM to expect during a compressor stall, or that some overspeed occurs (dependent upon flight conditions) on a quick throttle retard from full afterburner (AB) to military, or that the same very high altitude (above 90,000 feet) that allowed minimum fuel to flow to increase EGT to above 900°C, has on occasion driven RPM to over 111%?

Engine acceleration characteristics and their variations, because of altitudes and airspeed, are handy tools. Understanding of these principles will make you think twice before throttle bursting in a tight turn inside a thunderstorm at 50,000 feet and 250 knots. RPM fluctuations are never desirable, but let's analyze them. At military power, is RPM fluctuating alone or is fuel flow, EGT, and the nozzle fluctuating also?

If not, it must be the gage, if so, let's try afterburner; if the fluctuations persist, the temp amplifier becomes the prime suspect. If they repeatedly occur in one area of military or AB, but not the others, look first at the nozzle feedback cable. The RPM fluctuations usually disappear when the throttle is retarded below military, putting the nozzle on mechanical schedule. If the RPM, EGT, and fuel flow still waggle excessively, it just about has to be a main fuel control problem. Our objective is not to offer many memory items, but to throw out some food for thought designed to increase your "why" capacity and your ability to understand and retain the NATOPS bold face print.

Variable Exhaust Nozzle

Nozzle malfunctions can be determined by the reactions of other instruments, but with nozzle indicators positive identification is assured. Other than gage failure and misrigging or scheduling, nozzle failures usually fall into four categories:

1. Full open because of amplifier or electrical problems
2. Full open because of nozzle pump failure
3. Full open following oil loss, or
4. Closed to mechanical schedule because of electrical difficulties.

The only problem is that in most cases you, the pilot, won't know the cause; consequently, handbook procedures are based on the worst culprit—loss of oil. A good understanding of the oil system and the nozzle circuitry is certainly mandatory if ever that rare but undesirable multiple failure occurrence appears, and you've just never taken the time to learn to swim.

A good start is to understand the nozzle schedule and its approximate position at IDLE, CRUISE, MILITARY, and AB.

Fuel Flow

The fuel flow gages are most used for starting, both ground and air. Once again, it's wise to know e.g., takeoff power, cruise, minimum flow, starting. approximate flow readings at various conditions; One should also understand what parameters can vary these settings; namely, throttle position, RPM, CIT, and Compressor Discharge Pressure (CDP), and why the latter two of these are affected by airspeed and altitude.

The fuel flow gage becomes the primary instrument to recognize that rare but thrust crippling malfunction of Compressor Inlet Guide Vane (IGV) failure in the closed position. Even this is not easy, if up until now you only considered the flow gage as an ON-OFF indicator.

Oil Pressure

Last, but not least, are the oil pressure gages. The three critical areas are: high readings, low readings, and zero. High pressure could indicate an obstruction in the lube system and should not be ignored; but remember that higher than normal readings can be expected on colder days in addition to taking longer to stabilize. A little common sense based on ambient temperature *vs.* time will help you in determining whether your pressure is abnormal or normal.

In the F-4, you have had earlier warning of possible impending zero oil pressure. A generator light and a wide open nozzle are pretty good indicators that the oil level is down. There is no way to tell, however, whether the leak is in the nozzle system or the lube system until oil pressure starts toward zero.

The flight manual tells you to shut the engine down when the nozzle goes open. This is the best procedure for an unknown cause, but it's always good insurance to know the internal workings of the oil system just in case flight requirements necessitate the emergency use of this engine.

A good understanding of the engine gages can be the difference between cool-headed efficiency and complete *panic*. No one can argue against the relative merits of this difference during an emergency situation.

R. J. "Dick" Scoles served as a Navy pilot in World War II and has a degree in Mechanical Engineering from the University of Southern California. He joined the General Electric Company in December 1955 and has been a test pilot for the past nine years, spending the last seven as Chief Test Pilot. During this time he has logged well over 2000 hours of J-79 flight testing.

Headwork and Luck

Two instructors were flying a TF-9J on an IFR flight plan from Malstrom AFB to Richards-Gebaur AFB. They were cruising at FL 370 on top of a thin cirrus layer. Far below, a solid deck of clouds extended as far as they could see.

Five minutes west of O'Neill vortac (Nebraska), both pilots were startled by a tremendous noise and vibration accompanied by a few wisps of smoke in the cockpit. The pilot in the rear seat popped the instrument hood and both pilots began to look around for the problem. The noise seemed to be coming from the engine compartment, but all engine instruments were normal. They decided that the most probable source of the noise was the generator because there was at least one red light showing on the right controls and all of the flight instruments had failed. When the generator switch was moved to OFF, the noise abruptly stopped, so they left it there.

A quick check of the charts showed that Lincoln AFB was the nearest suitable field enroute to the planned destination. They decided to proceed toward Lincoln, looking for a hole in the solid deck below. Meanwhile, they selected emergency battery and monitored the last UHF frequency assigned and guard channel. Omaha Approach Control called on Guard, directing a 50-degree right turn for radar identification. They made the turn, but it wasn't observed by radar. For some reason, it was impossible to reach any station with the UHF, although they were able to hear several stations weakly. Because of these two facts, the pilots decided that flying the prescribed lost communications triangles would be a waste of time and fuel.

As they reached the vicinity of Lincoln AFB by DR navigation, no holes appeared below. Forecast weather for their original destination had been 2500 feet broken, 25,000 feet broken. The enroute alternate, NAS Olathe, was expecting 10,000 feet scattered. With this in mind, they decided to continue to destination via Olathe, still looking for any break in the continuous cloud deck below.

No holes appeared below on the way to Olathe, and none could be seen either side of course. They pressed on toward Richards-Gebaur, still looking.

When they had arrived at a DR position, about 7 minutes short of Richards-Gebaur, there was still no break in the undercast. They consulted the letdown plate and found that the minimum safe altitude for 100 miles around Richards-Gebaur was 5000 feet. So they decided to give it a go.

They entered the clouds at about 10,000 feet. With the inverters out, all navaids were out, fuel quantity and flow were an unknown factor, and they were partial panel. When they reached 5000 feet, they were still in the goo.

One more look at the letdown plate revealed that the minimum safe altitude for 25 miles around Richards Gebaur is 3000 feet. With crossed fingers, they slipped a bit lower into the murk.

Just as the altimeter needle slid past 3000 feet, the ground began to appear below. They broke out beneath the clouds at 2500 feet mean sea level, about 1500 feet above the ground. The visibility was about three to four miles in haze.

There were no particularly distinguishing features on the land below. No towns, no rivers, no major highways. Just section lines and an occasional farmhouse. They were completely lost.

On a hunch, they turned north and cruised for 5 or 6 minutes. Then they spotted a small town. The pilot in the rear seat was well acquainted with the general area. He had been born and raised in Missouri. He knew that most towns in the area had water towers, and the name of the town is usually painted on the side of the tower. They dropped down to take a look. There was a tower, but no name. Still lost.

They did see a small road sign on the outskirts of town alongside the main road. They figured they'd better take a closer look. The first pass failed to produce any useful information, but on the second *low* pass, the front seat pilot saw what appeared to be the name of a town, followed by "Ia.," presumably meaning Iowa. The knowledge of the "local boy" came into play again as he saw the initials "MFA" on a grain elevator. He knew that this stands for "Missouri Farmers' Association." He deduced that they were in the northwest corner of Missouri, so they turned southwest, looking for Kansas City or

some other metropolitan area.

The pilot in the front seat was flying at this time, and he picked up a heading of 235 degrees and held it for about 10 minutes. Fuel was beginning to occupy a good deal of their thoughts by this time, so they reviewed ejection procedures with each other. With nothing to lose since there was nothing in sight other than scarcely populated farmland, they decided to try the generator one more time.

It came on with a bang! The noise, vibration and smoke were at least as bad as before, but they held on long enough to see 950 pounds on the fuel gage. They also turned on the radio and tacan and selected 3-77 on the SIF.

They made one last Mayday call in the blind and started to pick out the field they would eject over. Their search was interrupted by a very weak call on the UHF. It was St. Joseph Tower, calling on Guard. They called St. Joseph asking for an emergency UHF/DF steer, but their signal was so weak that it wouldn't produce a usable cut.

Suddenly, a city and a river appeared through the haze—and a runway. The cockpit was filling with smoke and it was time to turn the generator off again, but they took time to ask the tower to flash the runway lights just in case the runway they had in sight was the right one. They peered into the haze at the runway—and the lights flashed. Not only was it the right field, they were even lined up with the duty runway! Just before securing the generator, they requested an emergency straight-in landing.

A commercial airliner had already been cleared for takeoff by the tower, but had held short. The *Cougar* touched down right in front of the amazed airlines pilots' noses. When they refueled, they found that there had been approximately 600 pounds of fuel left at touchdown.

When the maintenance crew which had been flown in got to work on the aircraft, they could find nothing wrong with the generator. Instead, they found that the main inverter, which is located right under the front seat in the nosewheel well, was the culprit. A main bearing in the inverter had failed, throwing ball bearings and parts of the bearing race all over the wheelwell. The shaft had become so badly misaligned that it caused a fantastic racket when turning. Some of the bearing race had hit the coaxial cable for the ARC-27 and mangled it badly. This accounted for the poor performance by the radio.

Both pilots stated later that the first thing they thought of when the noise started was the generator. When turning the generator off stopped the noise, they assumed that their first impression was correct. This assumption was based on more than 3400 jet hours including over 1600 *Cougar* hours between the two pilots. Despite this rather impressive amount of experience, and despite an extremely active NATOPS training program within the squadron, the assumption was *wrong!* It was a classic example of the fallacy in coming to a conclusion and then finding enough evidence to support it.

The pilots brought out another important item. OpNavInst 3710.7B states that *appropriate* aeronautical charts shall be carried in the cockpit for all instrument flights. Most pilots consider the high altitude jet charts the only ones really appropriate for instrument cross-countries in jet aircraft.

This is probably true, for the *planned* flight. On the other hand, when something *unplanned* occurs, such as described here, they aren't quite adequate. In this case, the appropriate charts became the ONC or Sectional charts for the intended route, or at least for the terminal areas. Since ONCs contain sufficient detail to help you navigate at fairly low altitudes, and since they are considerably more manageable in the cockpit than Sectionals, it would be reasonable to have them along on *any* flight. They would have been pretty handy on this one.

Another point of considerable importance is brought up by this incident. This is the absolute necessity of making rapid, intelligent decisions based on the best information available and then sticking to the decision.

For example, the decision to omit the lost communications triangles because radar was apparently not painting the aircraft resulted in a considerable saving of fuel and definitely contributed to saving the aircraft. Although the procedure used was nonstandard, it was indicated by the circumstances at the time. Once the plane was committed below the overcast, both pilots reported an unexplained desire to make random turns, hoping to sight a city or river or almost anything to help them navigate. Instead, they made a decision over the small, unnamed town based on the best information available, and then stuck to it, ultimately finding the runway at St. Joseph.

And last, these two pilots shared an abundance of luck. Of course they made some of that luck by sticking to the principle of making a decision and staying with it. Perhaps next time they'll increase the odds in their favor by:

1. *Analyzing* failures instead of making the symptoms fit a predetermined erroneous conclusion.

2. *Planning* to have communications/navaids failure and bringing along *all* appropriate charts.

Short Snorts

These Incident Reports Show That A Small Detail Could Be . . .

The Weakest Link in Your Flight

Lost Hatch

The overhead ditching hatch parted from an E-1B in flight, striking the aft nacelle section, the vertical radome support, the underside of the radome, and finally tearing loose the fixed wire antenna as it fell free of the aircraft. There was no damage to the tail section.

Maintenance personnel had removed the hatch two days prior to the flight for corrosion control and painting. It is probable that the hatch was not properly secured when the work was completed. The locking mechanism was inspected and no discrepancies were noted.

The pilot, copilot and controller could not recall physically nor visually checking the locking handle prior to the flight. A technician was not aboard but the seat directly below the hatch was occupied by the plane captain.

Corrective action has been accomplished by re-emphasizing the responsibility of plane commanders to determine the status of critical items and re-indoctrinating all crewmembers as to their specific duties. All aircraft commanders have been rebriefed as to their reliance on and briefing of crewmembers duties particularly when only partial crews are assigned.

Shrapnel

On return from a night ASW flight, the pilot of an S-2F taxied on an inactive runway to reach the blue-lighted taxiway leading to his squadron line. He turned off the runway early to intercept the taxiway at an angle.

The starboard prop contacted an unlighted waveoff light fixture and the starboard gear rolled over and leveled the frangible mounting.

All prop blades were damaged and several holes were punched in the forward fuselage.

The pilot erred in not continuing to taxi as cleared via the blue-lighted taxiways. Habit pattern from daytime use of this same type taxi and turn-off procedure contributed despite regular briefings to all pilots on this specific danger. Location of the light fixture is unfortunately necessary to comply with placement criteria.

General prudence would have dictated use of taxi light. Pilot stated that his desire to maintain flight crew and line crew night vision was the reason for non-use of the taxi light.

Holes (circled area) were caused by prop striking light fixture.

Bent Landing Gear Axle

While demonstrating full-flap touch-and-go landings in a T-28 the instructor made a hard landing with wind 18 knots gusting to 33. This incident was brought to the attention of all pilots in the command and re-emphasized that with high gusty wind conditions, no-flap landings are recommended in the T-28.

Loss of Equipment Bay Door

During preflight of a T-2A the pilots noted that the oxygen system had not been serviced as requested. While awaiting oxygen, the pilots remained in the cockpit and upon completion of servicing started the aircraft and taxied out.

Approximately four minutes after takeoff with a TAS of 270 knots, a loud bang was heard and the aircraft started to rumble. An immediate return and landing was made without further incident. Postflight inspection showed the starboard equipment-bay door missing.

Neither pilot nor copilot checked the security of the bay door after servicing. Inspection of the fuselage fittings indicate that the lower pins were not engaged just prior to loss of the door. The most probable cause of this incident was the pilot taking off with the equipment-bay door not properly secured.

Lightning Strike

During flight at 6000 feet in intermittent IFR conditions, numerous buildups and heavy lightning in all quadrants and moderate turbulence in clouds with no visible rain, an SP-2E was struck by lightning.

The strike was a medium bright flash with a tremendous crash. Crew was unable to check the aircraft to determine where the strike hit due to darkness and a malfunctioning aldis lamp.

Daylight revealed gasoline syphoning out of port wing tip tank from extreme after end.

Repair and Replacement

The F-4B was returning to home field in a VFR letdown. During the letdown the pilot noticed an unmarked dirt airstrip some miles from his field. He continued the letdown while observing the dirt strip.

The aircraft heading coincided with the centerline of a canyon which has a very steep gradient toward the upper end (in other words, a box canyon). A radar altimeter reading of 2500 feet began decreasing rapidly and the pilot noticed he was approaching the rim of the canyon.

With full military power applied the pilot began climbing. At the time the airplane was approaching the upper end of the canyon and the pilot felt a jolt. Three power lines were hung across the upper end of the canyon, approximately 500 feet above the floor. The aircraft broke the upper two.

Damage: vertical stabilizer torn. Anticollision light cover broken. Port outboard leading edge flap torn. Starboard missile pylon fairing torn. Starboard inboard, center and outboard leading edge flaps torn.

The pilot did not pay sufficient attention to where he was heading or his altitude while looking over the unmarked airstrip. The mouth of the canyon is very wide and the gradient of the floor is deceptive. All aircrews have been rebriefed to be alert at all times for dangerous situations that might be developing.

Overspeed

A simulated single-engine was given to a TS-2A student by retarding the starboard throttle. The student pushed both prop levers to the full increase position and then started up very slowly with the port throttle.

Just as the port engine RPM was starting to increase, the throttle was jammed full forward with a resulting overspeed in excess of 3000 rpm.

A continuing problem in training is that of anticipating all the moves of a student in the cockpit. All instructors have been briefed on the constant supervision of students, especially during simulated emergency situations.

This incident was thoroughly covered at APMs and student pilot meetings.

Old Problem—Fresh Experience

The pilot of an A-1H was on a Sandblower training flight, stepped-up in a number 2 position on the instructor. While at 500 feet above ground level he became engrossed in answering a question of the instructor regarding the location of an emergency field.

At just that time, fuel in the external tank was exhausted. As the engine began running rough the pilot took his attention from the chart, switched to main tank, flipped on the boost pump and monitored the fuel pressure.

A moment later, as the engine begin to smooth out, the pilot felt the left wing drop and he realized he was low. The wing cut off the top of a pine tree which at the point of impact was an estimated three inches in diameter.

"The basic cause," said the incident report, "was inattention on the pilot's part in not monitoring the aircraft flight path. An additional factor was the pilot's nonobservance of squadron procedure and briefing on fuel management" (never burn an external below 25 gallons while on low-level and use of the option to climb 1000 feet AGL to switch).

Total time of the pilot was 351 hours with 138 hours in the A-1. Previous low-level navigation hours were 3.4.

Facts do not cease to exist because they are ignored.—Huxley

UNSCHEDULED FIRE

Test hops have a way of conditioning pilots for any eventuality. Trouble is anticipated more keenly on this type of flight and therefore the pilot is usually primed and ready at the instant it occurs. This is a story about a pilot, a test hop and a *Crusader* with an unscheduled fire in the tail section.

At 1015 the pilot was on the line conducting a preflight inspection. He knew that the airplane had been skagged on landing a few days previous and had observed and followed the maintenance repairs to this point.

The damaged area of the tail cone had been patched and then repatched when quality control was not initially satisfied with the original job. The airplane had been turned up on the hotspot with the tail removed and the afterburner had been selected several times with no evidence of malfunction.

In addition to the scraped tail cone, the afterburner cooling shroud had been bent in on the underside. This had also been straightened and realigned. Even though the pilot had monitored the maintenance repairs, he carefully inspected this area and was satisfied as to the neatness and security of the repair. Except for the faintly wrinkled appearance of the stralghtened cooling shroud, and an inoperative clock, everything was up-to-snuff on the preflight.

Ground operations were routine. While in position for takeoff, the pilot jam-accelerated to MRT, checked the acceleration time and allowed the engine to stabilize. Then he recorded EGT, RPM, Oil Pressure, Fuel Flow and Pressure Ratio on the test card. All were normal.

The brakes were released and afterburner selected. Burner light-off was normal. RPM increased about 2 percent, and EGT started to rise slowly from the 610° at which it had stabilized.

After liftoff the pilot cleaned up, accelerated to 400 knots and remained below 1000 feet while clearing the area. Then he commenced a steep climb with a 30-degree bank left turn. At this point the airplane yawed left abruptly. Suspecting yaw stab, the pilot corrected with trim. The out-of-trim condition was only one ball width on the needle ball indicator but the yaw had been abrupt. A quick scan of the instruments indicated that fuel was transferring and EGT was at 615°

As the pilot shifted his attention back to clearing the area, he observed orange-colored reflections on the side of the starboard wing pylon. He immediately deselected AB, reduced to IDLE, turned toward a high 180 for landing and checked all instruments. They were normal and there was no fire warning light.

About this time the tower informed the pilot that he was on fire. His immediate inclination was to eject. Considering however that all instruments were normal, the possibility of the tail repair failing, good control with sufficient airspeed and altitude, and the fact that the airplane was over a city, he elected to continue with a precautionary flameout type approach.

About five seconds after initially detecting the fire, the pilot checked the starboard pylon again but could no longer see any fire reflections. Shortly after, while downwind, the tower informed him that he was still smoking.

Being low at the 180 (3000 feet), but fast (300 knots), the pilot held his altitude and delayed the gear and wing. At 220 knots both were extended normally.

At some point past the 180, the pilot realized that he was high and fast but felt that the approach had

After the fairing weldment parted, afterburner exhaust gases apparently reversed flow and caused fire damage.

progressed too far to allow time for corrections. Consequently, he flared sufficiently high to slow the rate of descent and touched down with 6500 feet to roll at 160 knots with almost a full load of fuel. He had initiated fuel dumping at the 180 but it was inadequate due to the short time involved.

At touchdown the engine was shut down and fuel dumping secured. The pilot then informed the tower that he would take the gear since braking was negligible at his speed and weight. As the engine unwound he lost electrical power and concentrated on lining up center and stopping the airplane. The hook was lowered about 2000 feet short of the arresting gear.

Braking was continued but the airplane still went into the gear at 90 knots. Arrestment was gentle.

The pilot immediately unstrapped but while standing on the canopy rail, contemplating the jump, he saw that the fire was out and decided to wait for a ladder rather than risk breaking his neck at this point.

In summing up his experience, the *Crusader* pilot has this to say:

"I believe if I had not been on a test flight, looking for trouble, and primed for trouble, I would have ejected at the first indication of a real fire."

(*The proximity of the field probably had something to do with his decision to stay with the aircraft also.—Ed.*)

CAT

Clear Air Turbulence

Clear air turbulence (CAT) has become a very serious operational factor to flight operations at all levels and especially to jet traffic flying in excess of 18,000 feet. The best available information on this phenomena must come from pilots via the Pireps procedures. All pilots encountering CAT conditions are urgently requested to report time, location and nature (moderate, severe or extreme) of the element to the FAA facility with whom they are maintaining radio contact. For consistent identification of the degree of turbulence, U. S. Standard Turbulence Criteria Table states:

Light—Loose objects in aircraft remain at rest.

Moderate—Seat belts required. Unsecured objects move about.

Severe—Occupants thrown violently against seat belts. Momentary loss of aircraft control. Unsecured objects tossed about.

Extreme—Aircraft is violently tossed about, impossible to control. May cause structural damage.

—FAA Airman's Information Manual

SEAT TALE

I was scheduled to launch at 2200 on the night (A-3) tanker flight. My fuel weight before going onto the catapult was about 20,000 pounds. I had checked this while taxiing out to the spot.

All catapult procedures were normal, but the cat shot itself seemed anything but normal.

I have a peculiar habit of emitting a slight grunting noise during normal cat shots to combat the G-forces sustained therein. However, upon feeling the initial acceleration of this particular cat shot, I seemed to have lost all sense of normalcy, and was first aware of being pinned against the top of the canopy in an awkward position.

I recall having the feeling that my feet were a good foot from the rudder pedals and that my knees were up around the area of the yoke. My neck and head were bent forward at what seemed to be a 90-degree angle due to being hard pressed against the canopy.

One thing that probably prevented me from retarding the throttles during this wild ride was an established habit of maintaining a deathlike grip upon the catapult handle.

I do not recall raising the gear but was sufficiently aware of the problem to decide not to clean up the aircraft further until some altitude had been attained. So we climbed to about 2000 feet before retracting the flaps and transitioning to climb speed.

Since I was still pinned in the same awkward position (lessened somewhat now by the reduction in G-forces) I had the third crewman examine the cockpit for damage. He found that both my seat and his own had broken loose from the forward retaining mounts. (*Maintenance error involved during previous work on seats.—Ed.*) As our seats tore loose the escape chute actuating pin dislodged, forcing them backwards. My seat had come to rest about a foot off the cockpit floor, perched at a precarious angle on top of the actuating pin.

The flight to a divert field and subsequent landing was uneventful, though a bit uncomfortable in my case.

60 Seconds of Hail

The first half of a ferry flight in an F-11 was over and I headed for the Operations snack bar. Nothing like a bowl of hot soup at the end of a hop to cure what ails you. My ultimate destination was Cherry Point so after lunch I checked the weather. It was deteriorating and a line of thunderstorms stretched across my path and northwest of my destination.

The thunderstorms enroute were not large enough to preclude overflying or going around. Apparently there was one northwest of Cherry Point that was a granddaddy of the "boomers." It was predicted to hold to the west for

ANYMOUSE

The purpose of Anymouse (anonymous) Reports is to help prevent or overcome dangerous situations. They are submitted by Naval and Marine Corps aviation personnel who have had hazardous or unsafe aviation experiences. As the name indicates these reports need not be signed. Self-mailing forms for writing Anymouse Reports are available in readyrooms and line shacks. All reports are considered for appropriate action.

—REPORT AN INCIDENT, PREVENT AN ACCIDENT—

a couple of hours which would be about all I'd need.

After some talk about clearances (tacan versus omni) I got a usable route except that my flight level was 290 instead of 370 as requested.

Into the air and on the way.

After leveloff I went through some turbulent areas and finally was cleared to flight level 370. As I rose above the clouds at 36,500 feet, the world turned into a contrast of brilliant white fleece and dark shadows on the cloud formations below me.

At times like these it seems like cheating to accept any pay for flying. To the north I could see large thunder bumpers that towered over me by 10 to 15 thousand feet. The route to Beaufort was clear with the exception of some high cirrus at my altitude. A quick check with Beaufort Metro revealed a storm between Wilmington and Cherry Point had been reported—3000 feet overcast in heavy rain. If that was all one storm it must be a goodie as that is about 90 miles. The cirrus was solid now so I requested and received flight level 390. Its always best to be able to see the thunderstorms rather than find them the hard way. After passing Charleston I could see the small storms that were on the fringe of the large one. The entire storm area lay directly in my path and appeared to top 50,000 feet. I asked for 43,000 as this would give me the best altitude performance for my aircraft in case I ran into high turbulence.

The best way to avoid the storm and still reach Cherry Point seemed to be a detour to the east in the cirrus layer and then let down over water back toward the shore. Washington Center approved the deviation and I entered the cirrus at flight level 430. I had slowed to .88 indicated mach number since this would be best speed in case of rough going. After turning on the flood light (to minimize lightning blindness) I settled down to a scan of the instruments.

There was a quick recognition of relative motion as I entered the clouds and then the grey white nothing. After about 30 seconds the light began to fade but I felt this was normal as I was down sun from a very big towering storm.

The first visible moisture appeared on my windscreen and I was wondering about rime ice at this altitude when all hell broke loose. Someone was in front throwing rocks at me. The aircraft pitched and bounced like a cork on a rough sea.

This wasn't supposed to be in the deal. There isn't supposed to be hail and turbulence at this altitude, especially here in the fringe area. Subconsciously I was thinking, "fly attitude, fly attitude; don't worry about anything else until you get hold of the situation."

Lightning and Saint Elmo's fire danced across the windscreen. Being a chicken at heart I started a 180-degree turn. The attitude gyro remained within reasonable limits but the altimeter was running up and down like a drunken ox and the rate of climb needle was alternating against the high and low side of the scale.

As I completed the 180 the earphones ceased to emit I.D. signals and normal side tone noises. The OFF flag showed on the tacan and the UHF circuit breaker had popped. Neither of these things was very pressing or at least not near as important as remaining in some sort of approved aeronautical balance.

Transition from the howling storm to the summer sun was sudden and as glorious as a sunrise in the mountains. I took stock of my situation—30 seconds into the storm, 180 turn, and 30 seconds coming out. No radio, no tacan, no identification radar, no direction finder, large dents in the leading edges, radar dome damage, and one wide-eyed pilot.

Continuing on to Cherry Point was out of the question so I back tracked 50 miles to Myrtle Beach AFB. They were waiting for me. Washington Center had noted my flight path on radar and had advised the AFB of what appeared to be my intentions. I received a green light for landing.

The boys in blue served up a new radio while the storm continued out to sea. My low level flight at 200 knots to Cherry Point was smooth and uneventful. Even so I felt like I had earned this day's pay.

Reader Questions Headmouse Answers

Have you a question? Send it to Headmouse, U. S. Naval Aviation Safety Center, Norfolk, Virginia 23511. He'll do his best to get you and other readers the answer.

Wiring Specs Change

Dear Headmouse:

While inspecting an HU-16C, 12 cannon plugs were found installed without being wired for security. The shops concerned stated "It just isn't done." I can find nothing which states these items do not have to be safetied. I do find a document where it implies this should be done. Please quote any references you may have concerning this matter. In the meantime I shall continue securing cannon plugs regardless of local practices.

GEORGE A. VALDESPINO, AE1
AMD QUALITY CONTROL
ROOSEVELT ROADS, P.R.

▶ This subject was covered quite extensively in the December 1964 issue, page 22, "Shearwire vs Lockwire." You are correct in insisting that cannon plugs be secured. This practice is supported by the documents listed in that article as well as the last paragraph of BuWeps letter RAAE-333/205:GDN dated 15 March 1965 to NASC and references listed therein.

It is quoted as follows:

"Subj: **Clarification and Updating Publications Affecting the Terminology and Use of Lock Wire, Shear Wire and Seal Wire; NASC request for**

Ref: (a) MS33540, Safety Wiring, General Practices for
(b) NavAer 01-1A-505, Handbook of Installation Practices for Electrical and Electronic Wiring
(c) NavAer 01-1A-8, Structural Hardware Manual
(d) NASC ltr NASC/we; Ser: 30/1536 dtd 28 Sept 1964 to BuWeps

1. Reference (d) pointed out that inconsistencies in references (a), (b) and (c) have resulted in maintenance malpractices which affect safety of flight.

2. The following is the specific information requested:

a. A project has been established at NAEC to determine the changes to reference (a) that will clarify the terms Lock Wire, Shear Wire, and Seal Wire. Also, it will define the color identification of the materials to be used. The estimated completion date for the revision of reference (a) is 1 December 1965.

b. Reference (b) is being revised to use the above terminology and will be published within the next six months.

c. Reference (c) will be revised using the above terminology and other changes to reference (b) as soon as these are available.

d. Shear Wire, as an anti-vibrational device, is acceptable securing wing nuts, etc., to mount electronic equipage."

Definitions:

Lock Wiring—The application of wire to prevent relative movement of structural or otherwise critical components subjected to vibration, tension, torque, . . . Material: Inconel, uncoated; Aluminum Alloy 5056 clad is used for lock wiring magnesium parts.

Shear Wiring—Applications are those where it is necessary to purposely break or shear the wire to permit operations or actuation of an emergency device. Material: copper.

Seal Wiring—Applications are those where the wire is used with a lead seal to prevent tampering or use of a device without indication. Material: copper.

Very resp'y,

Headmouse

Engine Fire Signal

Dear Headmouse:

The May 1965 APPROACH carried letters about nonexistence of a standard signal to be used by the ground crew to signal the pilot, during engine start, that a fire has developed in the engine area.

The following is quoted from the P-5A/B NATOPS Manual (3rd rev.) Chapter two, page 2-3 under the heading of "Standard Ramp Hand Signals":

"*Engine Fire.* This signal should be given by the fire watch only and consists of placing the left hand on the top of the head and pointing to the fire area."

"*Use the Fire Bottle.* This signal should be given by the pilot only and consists of a rapid fanning motion of the hand in front of the face."

The latter signal gives the pilot positive control over ground personnel in any attempt to put out a fire. These signals are also in the process of being incorporated into the forthcoming P-2 NATOPS Flight Manual.

H. K. COOLEY, CDR
CO VP-31

Dear Headmouse:

. . . While conducting NATOPS flight checks I asked numerous ground observers how they would notify the pilot of an engine fire and when they would begin extinguishing the fire.

Some of the methods these people stated they would use to cope with an engine fire are frightening.

. . . Most were uncertain as to when they should use the fire bottle they are manning. They wouldn't necessarily wait until the propeller stopped or until direction had been received from the pilot, before they commenced discharging CO_2. . .

L. C. PETERSON, LT
SP-2 AIRCREW NATOPS EVALUATOR

▶ Good show, gentlemen. Your reports may be the forerunner of a standard signal throughout naval aviation. Lt. Peterson confirms the incorporation of the signals quoted by Big Boat Skipper Cooley into SP-2E and SP-2H NATOPS Flight Manuals. In the interest of standardization this procedure for reporting an engine fire and pilot-to-firewatch communication was referred officially to the Chief of Naval Operations.

Very resp'y,

Headmouse

Vertigo Problem

Dear Headmouse:

We fly the ....., a single pilot aircraft, but we still receive frequency changes during low altitude approaches under instrument conditions. This vertigo inducing problem was supposed to have been licked years ago.

What do we do, shoot from the hip?

SPRING LOADED

▶ Relax, 'cause it's a continual education process. You can help by (1), requesting same on your DD-175; (2) report cases to NASC with adequate documentation. We will initiate action with FAA for further indoctrination of Air Traffic Controllers, through our onboard FAA representative.

Very resp'y,

Headmouse

Field Arresting Gear Cable Markers

DEPICTED here is the standard day and night marker denoting the location of arresting gear which was recently approved by the Bureau of Naval Weapons. The specifications were issued as Change 28 to NavWeps 00-100-105, Planning Standards for shore facilities.

General design requirements for the 7-foot by 30-inch plexiglass markers include:

A. The signs will be removable from the foundation in the event the arresting gear is out of commission, or the location of the gear is changed.

B. The signs will be internally lighted with a flasher installed.

C. Signs will be installed on both sides of the runway directly opposite each other and normal to the runway centerline.

D. The signs will be directly on line with the nearest deck pendant in the direction of the engaging aircraft.

Pilots who have had the occasion to use the arresting gear on fields having such markers, report that the markers are a valuable aid, particularly at night. The availability of these specifications now makes it possible for operating and programming personnel to update their fields.

A COLLECTION OF RARE BIRDS

Through the ages men have given many special terms to describe birds in groups.

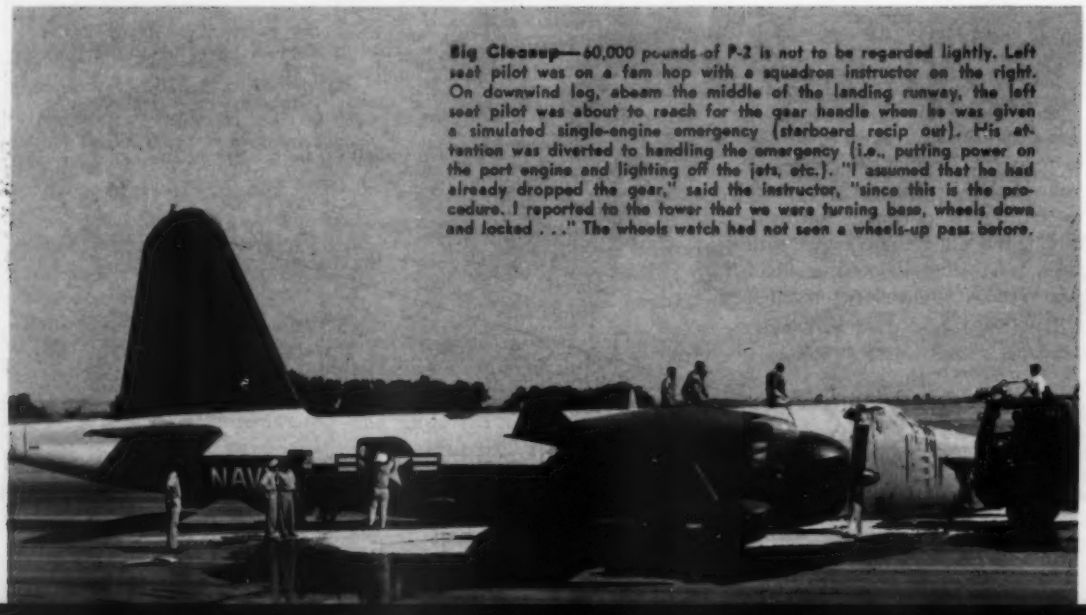
Some common English language examples are: A **gaggle** of geese; a **bevy** of quail, and a **covey** of partridges. Lesser known terms include, a **cast** of hawks, a **muster** of peacocks, and a **covert** of coots.

What special term could we give this group? A **smash** of bellyfloppers? A **squat** of roadsitters? Or perhaps, a **rash** of bottomsliders.

Note to birdwatchers: Three years were required to collect this rare group.

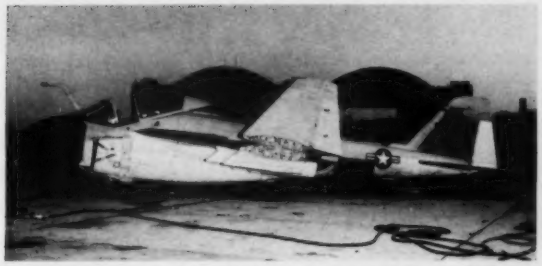
Close Scrape—For the pilot (2700 total hours) the only good thing about the situation was that it could have been worse—It could have been an accident. That's right, the F-4 wheels-up landing resulted only in an incident report. A night actual GCA with rain at the destination, a low fuel warning light, and an expedited descent to glide slope provided enough distraction for him to forget the gear handle. Outside of normal flight operations, no wheels watch was posted.

String Breaker—Prior to this "landing" the pilot had over 4000 accident-free hours in fixed and rotary wing aircraft. Shortly after entering the break, while turning downwind, the tower notified the pilot of traffic in his area. He acknowledged sighting the reported traffic and at the same time indicated that he had "three gears." Distraction and interrupted habit pattern were considered cause factors. No wheels watch was on station.



Big Cleanup—60,000 pounds of P-2 is not to be regarded lightly. Left seat pilot was on a fam hop with a squadron instructor on the right. On downwind leg, abeam the middle of the landing runway, the left seat pilot was about to reach for the gear handle when he was given a simulated single-engine emergency (starboard recip out). His attention was diverted to handling the emergency (i.e., putting power on the port engine and lighting off the jets, etc.). "I assumed that he had already dropped the gear," said the instructor, "since this is the procedure. I reported to the tower that we were turning base, wheels down and locked . . ." The wheels watch had not seen a wheels-up pass before.

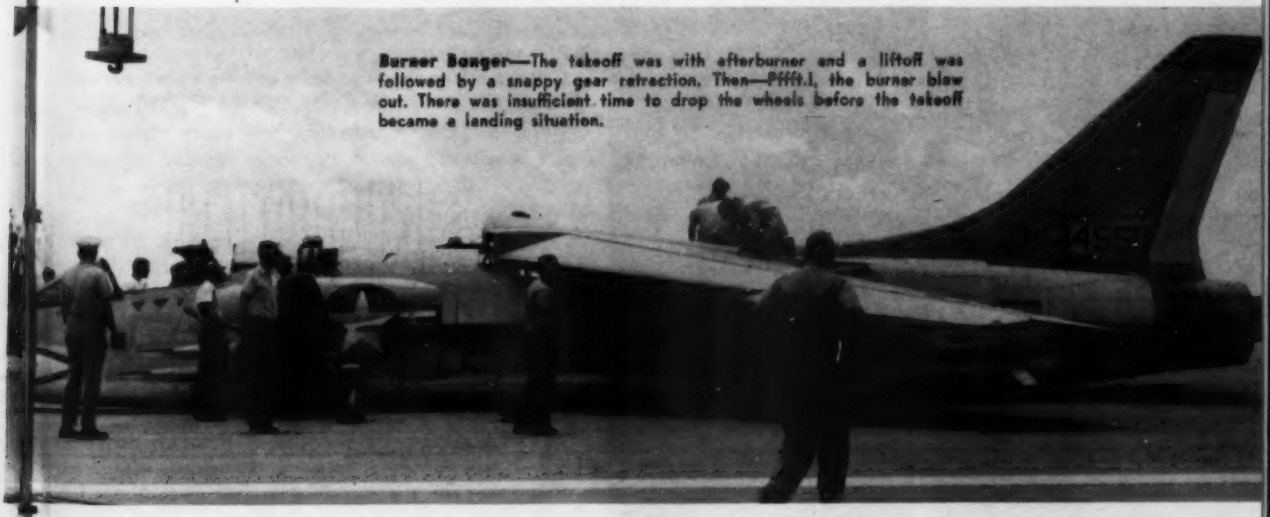
Curious Pose—The E-1B presents an unusual skyline in this embarrassing position. The fifth approach for the fam pilot was to be no-flaps. On downwind, traffic was announced as a practice GCA on a closing course; however, the tower added that the GCA traffic would be breaking off shortly. The instructor pilot was closely observing the traffic and handling communications while the fam pilot concentrated on flying the aircraft. Can you guess what happened? No wheels watch was on station.



Supply Special—With its folded gear and wings, this A-6 looks like it might be ready to be put back in the packing crate. The pilot folded the wings when clear of the runway and shut down before the gear pins were installed and before external power was turned ON. It's not supposed to happen, but a material defect in the landing gear selector valve allowed the gear to collapse.

VANISHING BREED?

The number of sightings of the "legless lander" around air stations seems to have reached a low point since the species first appeared. In fiscal 1965 inadvertent gear-up landings resulted in 4 accidents and 11 incidents.



Burner Banger—The takeoff was with afterburner and a liftoff was followed by a snappy gear retraction. Then—Pfft!, the burner blew out. There was insufficient time to drop the wheels before the takeoff became a landing situation.

The flames increased very rapidly until the aircraft was completely engulfed. It then went straight down.

SMOOTH EJECTION

Approximately 10 miles southwest of the field I was heading inbound at about 4000 feet, flying one of the no. 3 slots in a two-flight for-

mation, (three F-8Es each) when my flight leader said 'Check your right-hand side.' I glanced back and saw in the rear view mirror flames slightly behind and below the missile stations. I transmitted, 'I'm on fire.' Immediately the flight leader (and the no. 2 man) transmitted 'Eject!'

"I straightened my back, consciously placed my feet on the rudder pedals, looked up slightly and, with both hands, pulled the face curtain handle.

"Ejection was relatively smooth but firm. Going out, something hit me slightly above the right eye. My helmet visor was not down because the sun was behind clouds and visibility was better with the visor up. I had the feeling of doing a backward somersault and then the chute deployed immediately. Chute deployment was smooth and firm. My oxygen mask was still on and still delivering oxygen. I released the right fitting on the oxygen mask. My kneeboard was down around my left ankle. A short distance away I saw the *Crusader*.

"The aircraft was climbing slightly, heading inbound. The flames increased very rapidly until the aircraft was completely engulfed. It then went straight down. I didn't see it hit. There was a lot of debris in the air around me falling into the water below.

"I started reviewing my procedures for getting out of the parachute and into the raft. Found the yellow lanyard in the seat survival pack and pulled it up between my legs. Had already unhooked the left lap rocket jet fitting, allowing the seat pack to fall away slightly. After hooking the lanyard to my left torso harness lap connection, I pulled the D-ring slightly on the pack and pulled the raft out a bit so there'd be no trouble with it in the water.

"As I neared the water, it became obvious that I was swinging quite a bit in the chute, but not uncomfortably. I hit the water with my back and went completely under and immediately released the left shoulder harness rocket jet fitting. Surfacing, I inflated my life preserver.

"Rolled over on my stomach and with both hands released the right shoulder harness rocket jet fitting. (Both fittings came free with very little difficulty.) The parachute was right in front of me so tried swimming away from it. When I felt I was clear, pulled the raft out completely and inflated it, crawled in and pulled the seat pack in with me. Green dye marker was in the water all around me. Although the swells seemed moderately high I didn't have much difficulty in the water or with the raft.

"After getting in the raft, I saw the flight leader orbiting me and waved several times to indicate I was okay. The other four F-8Es were also orbiting.

"Collected all the gear I could into the raft and tried to secure it as well as possible. In anticipation of the arrival of the helo, readied one of my day/night distress signals. At approximately 1410H, observed a *Dumbo* heading out from the field. Pulled the day end of the distress signal to give the *Dumbo* the wind line. The *Dumbo* circled and then I saw the helo coming. Fired another day/night distress signal. (Both signals worked normally.)

"The helo was coming straight into the wind and right at me with the sling down. As he neared, I left my raft but neglected to remove the seat pack's yellow lanyard from my torso harness. This prevented me from getting to the sling immediately. Removed it and swam about five yards to the sling. Getting into the sling was no problem and I was soon aboard the helo."

Investigating flight surgeon's comments: "The pilot showed good judgment in utilization of proper emergency procedures and made the proper decision to eject at the right time. The pilot credits (the flight leader) as well as himself with the decision to eject and feels that his advice made it easier to make this decision. This demonstrates teamwork. Proper positioning was carried out prior to ejection as evidenced by no back injury. The fact that the pilot's helmet visor was not down accounts for his eye injury (*a minor bruise of the right eye possibly resulted from the face curtain restraining strap or the face curtain handle itself.—Ed.*). Rescue teams were on the spot within 25 minutes. Ejection, survival and rescue was very successful and all equipment operated successfully without any malfunction."

The Aircraft Accident Investigation Board made the following recommendations in the equipment and survival area:

- Reemphasize the advisability of lowering the helmet visor prior to ejection where time permits.
- Design the helmet to accommodate two visors, one clear for night and low visibility flying and one visor to reduce sun glare. The frequent transitions from day to night flying conditions or from VFR to IFR conditions during one flight require separate visors for reasons of flight safety.
- Review of the procedures for helicopter rescue with particular emphasis on the requirement for detaching the raft lanyard from the torso harness prior to pick-up.
- Wearing pistols (or suitable substitute) on all overwater flights in accordance with NATOPS.

Tangled Lines

After a normal preflight, an A-5A launched on a combination test flight and air demonstration mission. After completing the major portion of the test flight, the air demonstration formation was joined. When a hydraulic leak was noted from the port wing, the aircraft left the formation to return to the ship. On the way, complete hydraulic failure occurred with loss of flight controls. The pilot and bombardier/navigator ejected. The bombardier/navigator was the first to go....

continued

"I switched to ICS and told the pilot that I was leaving. Drew my knees up, dropped my visor and tightened my oxygen mask. Grabbed the face curtain and pulled. Don't remember the seat bottoming or the knee bars, foot retractors, and shoulder harness positioning. Almost immediately, I felt the seat fire although the force was much less than I ever expected.

"I remember tipping slightly face down and then felt seat separation. Again, the force was lighter than anticipated. With head slightly down, I looked down and saw the parachute streaming out behind. The chute blossomed normally with a force that was less than anticipated. Descent was normal.

"I released the raft at approximately 7500 feet. It deployed and inflated normally. The raft began to whip back and forth which caused me to oscillate excessively. I constantly fought this to keep the chute from dumping. During descent, I saw the pilot and, down below, the carrier in a starboard turn. I noted the pilot's and carrier's positions relative to the sun's position. I removed my oxygen mask for approximately 30 seconds, then reinstalled it. At approximately 3000 feet, my emergency oxygen bottle became empty and I removed the face mask but left it attached to the Scott block.

"Upon reaching the water, I released the right parachute rocket jet fitting. The left one would not come off by normal methods. Finally I pulled the riser down to allow some slack and then removed the fitting with my right hand.

"I pulled both toggles on my Mk-3C life preserver and had no problems staying afloat. (*Since this accident, new inflation procedures call for inflation prior to water entry.—Ed.*) I then connected the raft lanyard to my torso harness but remained outside of the raft for about five minutes while trying to untangle the sea anchor from the raft retention line. I thought of sharks and decided to forget the tangle and climb into the raft. My first attempt failed. On the second try, I got in but found it difficult to turn over. I then realized that the upper portion of the survival kit was still attached. I released both fittings and had no difficulty righting myself in the raft.

(*BACSEB 32-62 tells you to connect the drop lanyard to a shoulder rocket jet fitting before releasing the upper portion of the survival kit prior to entering the raft.*)

"First I cut away the seat pan from the raft. Then, I began removing signaling devices from the survival kit. I found the day - night distress signals hard to separate. I managed to free one and then put it

in my anti-G suit pocket. I zipped the pocket, leaving only the string from the signal exposed.

"I loaded my personal pencil flare and, with string still attached, I put it by my leg between flight suit and anti-G suit. During this process, all of the equipment in the kit became entangled in the line which ties the items together.

"While trying to untangle this, I removed my helmet and put it on my left knee. I could only see the pilot when we were both on the crest of a wave although he was only ¼ mile to the north. I estimated the sea state at 6-10 feet. Shortly thereafter, I noticed an aircraft approximately three miles to the northeast. I fired a Mk13 distress signal. However, the plane made a turn away from me and disappeared. Three or four minutes later, I heard it again. This time it was coming straight towards me. I fired another Mk13 distress signal and deployed the dye marker. The plane made a starboard bank and passed over about where the pilot was.

"In about 5 to 10 minutes, I noticed a helicopter approaching from the north. It was about 15 yards away. I released the raft, swam to the rescue seat, and was hoisted into the craft.

"The helo then picked up the pilot and returned to the ship without further incident.

"In conclusion, I am thankful for the training that I had received prior to this incident. Although, this training does, at times, seem repetitious to the point of boredom, the result is well worth the time involved. At no time during this incident did I have to stop and think about what to do next. I had every confidence in the reliability of the ejection seat as well as my ability to survive in the water. I seemed to recall instantly what to do, how to do it and when to do it."

...then the pilot ejected...

"After things quieted down, I looked out from under the curtain and as I did, I experienced buffeting and a good heavy jerking. The next time I remember looking, I saw that the chute had opened and that I was free of the seat. I saw the orange and white drogue chute below me and saw the ship turning in the distance. I was still breathing oxygen. I took off my mask and decided that it might get me entangled in the shroud lines in the water so I disconnected it and threw it away. I took off my gloves and put them inside my flight suit. I looked for the D-ring and finally determined that it was already gone. Its retaining pocket was empty.

"I inventoried my gear and noted that I had lost an extra shroud cutting knife which I carried in my left sleeve pocket and a jacknife from a leg pocket. I looked for my shroud cutting knife between the lap fasteners and it was not there. At the time I thought that it was lost but actually I had previously placed it on my chest strap when we changed from the MA-2P harness to the MA-2. I saw the .38 and hunting knife on my chest and felt around until I found my pencil flare gun, also on my chest.

"I tried to keep the ship in sight by turning in the harness and went over in my mind what I would do when I entered the water. I could also see my bombardier/navigator floating down above me, close aboard.

"I pulled the kit release handle and saw the raft fall out and inflate. As I neared the water, I placed my hands on the rocket jet fittings to the risers. I saw the raft hit the water and took a breath. When I came up, I was still attached to the chute by my left-hand rocket jet fitting. I reached for the rocket fitting with both hands and either missed it or couldn't get it to open.

"By this time, I was under water and could feel myself being towed. I pulled the left-hand toggle of my life preserver, surfaced, then went for the rocket jet fitting again. I went under water and when I felt myself getting short of breath, I pulled the right toggle to my Mk-3C and surfaced. I then pulled on the riser and released the left-hand rocket jet fitting and the chute drifted away.

"Once when I surfaced, my head was entangled in some line and I either removed my hard hat or it was pulled off by the line. The hard hat was floating nearby. I made no effort to retrieve it but concentrated on getting into the raft. I pulled the raft towards me and started to disentangle the lanyard to attach it to my harness. As I was doing this, I saw the chute was getting closer so I paddled away from it. When I had attached the life raft lanyard to my harness, I released the lap rocket jet fittings, which worked smoothly and easily, and got into the raft. A dye marker had broken open, and there was a trail of green in the water. After a moment's rest I looked at my watch; it was 1410P.

"I pulled the survival pack into the raft, opened it and inventoried the contents. I removed the mirror, attached it to my harness, and stuck it in the top of my flight suit. I then removed the solar still and zipped the survival pack closed. I opened the solar still and attached it to the raft. Then I read the instructions. I thought I heard a plane and started to get out a day smoke distress signal, but then the noise stopped.

"I started to blow up the solar still. Shortly thereafter, I heard a plane and then saw a *Willie Fudd*. I took a day smoke distress signal out of the survival package but couldn't get the line free so I ignited it and held it in my left hand while holding

the survival pack in my right. The plane headed towards me and when the smoke had gone out and I was satisfied that the pilot had seen me, I wet the signal to cool it off and put it in the survival package which I zipped shut and placed in the water.

"I continued to watch the *Willie Fudd* and blow up my solar still until I saw the helicopter. When the helicopter came toward me, I paddled around to face it. When he dropped the seat, I unfastened myself from the raft and slipped into the water. I experienced no difficulty in mounting the seat or entering the helicopter."

The investigating flight surgeon discusses survival aspects.

"The rear seat emergency oxygen supply was exhausted sooner than anticipated. The bombardier/navigator's statement indicates that he removed his oxygen mask during the descent for 10 seconds, replaced it and ran out of oxygen at 3000 feet. A test of the emergency oxygen supply flowing through a regulator and mask freely resulted in exhaustion of the oxygen supply in 2 minutes 20 seconds. While the mask is used for breathing, flow of oxygen is interrupted during each exhalation, thus conserving the oxygen supply for its rated 20 minutes. It was determined that the bombardier/navigator had checked the emergency oxygen supply indicator prior to flight and that it was in the green area. It is believed that the bombardier/navigator's estimate of the time he removed his mask is in error and that premature exhaustion of the oxygen supply was due to removal of his mask.

"Both survivors reported some difficulty in the release of the rocket jet fittings. The pilot noted preflight stiffness of his lap belt fittings. In the water he had difficulty releasing the left shoulder fitting but not the lap belt fittings. The bombardier/navigator had difficulty releasing his left shoulder fitting. In each case the difficulty was overcome by creating slack in the parachute riser.

"Mild exposure with reduction of body temperature was experienced by both survivors in spite of rather fair weather. This was due to evaporative cooling by the 13-knot wind.

"Both survivors reported some difficulty with tangling of survival gear. The squadron packs the seat pans with each item of gear tied in a series to a single line to prevent loss. Alternate methods of packing with each piece of gear tied separately to a central ring or to another straight line would not prevent tangling but would permit cutting a piece of gear free without the possibility of losing all or part of the rest of the gear.

"The pilot was wearing his anti-G suit directly next to his skin without intervening flight suit or underwear. The bombardier/navigator had no flight gloves. If fire in the cockpit had been a part of this accident, both could have suffered preventable burns due to these omissions."

The flight surgeon recommended that:

- The limited amount of emergency oxygen available be reemphasized and that the danger of exhausting the supply prematurely if the mask is removed be pointed out in training.
- The squadron reevaluate the method of securing gear in the seat pan.
- Flight gloves be worn on all flights and anti-G suits be worn over underwear or over the flight suit according to the directive in effect.
- Continued efforts be directed toward development of quick release fasteners. (*Rocket jet fittings are currently being succeeded by the Koch fitting. The combination of the proposed Koch fittings and the parachute canopy deflation pockets per Clothing and Survival Equipment Change 5, Rev. A, is expected to reduce the possibility of being dragged through the water by parachute.—Ed.*)

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CURTAIN FLAP

By LT R. D. White

It was like stepping into a steam bath as I left the airconditioned hangar on the humid 98° August afternoon and walked to the line shack. Upon completion of the external preflight, my flight suit was saturated and in mounting the *Crusader* the rocket jet fitting on the ejection seat burned my hand. I had no idea at the time that in about 20 minutes I would cool down considerably.

After an afterburner takeoff, the section headed out to sea for a high altitude intercept training flight. Upon crossing the beach and climbing through 20,000 feet, I was startled by a blinding flash and loud explosion. I was unable to see for what seemed an eternity (approximately 2-3 seconds) and it suddenly was quite breezy in the cockpit. As my vision returned, I observed cards flying from my kneeboard and determined that the port windscreen had imploded. Moments later I saw that my entire canopy had imploded. My eyes burned and felt as though they were filled with sand. It was then I noted my visor was shattered.

My first reaction, even prior to the return of my vision, was to slow down. Since I had been indicating 350 knots just prior to the incident, I had retarded power, extended speed brakes and dumped the nose. Upon return of my wits I checked my airspeed—275 knots.

My next immediate consideration was the face curtain; as one might surmise, it was flapping gayly in the slipstream. I reached to retrieve it with my left hand, but the slipstream was too much. I then remembered a story I had read in APPROACH about a *Crusader* pilot reaching for his face curtain in a similar situation. The slipstream dislocated his shoulder and his landing approach was shot with one hand. I decided then to let it continue as it was. (*ACSC's 4 and 5 will preclude this problem.—Ed.*)

I was descending back toward the field, deviating off course only to the north, avoiding the city in event of inadvertent ejection. This course would take me directly over the civilian airport.

I was unable to read my wingman's transmissions due to the wind blast but he was still on my wing. . . . I had made a transmission of my difficulty and intentions. We then communicated by hand signals. He informed the civilian tower of our transiting the control zone.

My eyes were burning again, and I could hardly see. I glanced into the mirror and saw that a mixture of sweat and blood from the cuts on my forehead and left temple was running into my eyes. I tried not to rub them because of the grit and possible glass present.

I leveled off at 5000 feet 12 miles northeast of homeplate. I knew that if inadvertent ejection took place chances were good I would have to separate from the seat manually due to the drogue gun firing through the face curtain. I dirtied up and again began descending at 7 miles. In this configuration I could once again read transmissions on the radio and I noted the face curtain flapped less. This was a somewhat comforting feeling.

I greased on the landing from a straight-in approach to 12,000 feet of *terra firma* and the rollout was uneventful. The tower informed me that the crash crew would safety my seat. I questioned their knowledge of the seat and the tower replied that they were checked out. I stopped alongside the crash truck at the end of the runway. There was no need to open the canopy because over 85% of it was gone. A crash crew member climber up alongside and I handed him my seat pins. He gently picked up the face curtain and installed only the face curtain retention pin, then went back to the crash truck. This did absolutely nothing. I taxied back to my line where the ambulance was waiting and shut down. Everything then went routine.

In safety-summarizing this incident, I first of all will say that I am a big fan for flying with the helmet visor down. Due to the bruise and cuts on my forehead, the medical department determined had it not been down, to absorb the initial impact, I might have sustained permanent disability. Also the helmet itself was cracked in two places and a bit beaten up.

My next point is the importance of the crash crew knowing how to safety an ejection seat properly. The sear pin was the one necessary for seat safety and the curtain cable was taut against the sear. A modification has since been effected for similar situations in event of face curtain dislodging. A lanyard pulls the curtain to the starboard side of the seat, preventing drogue gun entanglement.

Also it was sure nice to have a good wingman with me all the way . . .

Vertigo

Unanticipated entry into a cloud at low altitude probably set off the chain of events which terminated in the loss of an F-4B and its crew. The conclusion of the aircraft accident investigation board was that "although the cause of this accident must be classified as undetermined, the most probable cause was pilot factor through disorientation or vertigo."

The F-4B was launched on an early afternoon VFR flight as part of a six-plane CompEx training exercise. Escorting the tow aircraft outbound, the F-4B joined the orbiting aircraft as they were commencing the first intercept. The lead aircraft completed its intercept and then led the formation in a gentle left turn to clear the tow plane which was approaching head on. The formation then turned right to take up its original heading. Both of the turns were made in a gentle climb.

In the midst of the second turn at an altitude of about 800 feet, the aircraft entered a low hanging cloud which completely obscured the horizon and the ocean below. The lead aircraft, the observer and the third trailing F-4 all climbed above the top of the cloud and rejoined. The F-4B in question was not in sight. Attempts to establish radio contact with the missing aircraft were unsuccessful. Systematic search failed to reveal any trace of the missing aircraft or its crew.

There was no transmission from the lost crew at any time during the flight to indicate aircraft malfunction or psychic/physical distress on the part of either the pilot or RIO. The entire intercept was run over water, well clear of other aircraft and obstructions. The aircraft's maintenance history showed no discrepancies which the aircraft accident investigation board considered significant.

"Sudden unexpected change from visual to instrument flight may have resulted in momentary disorientation, loss of altitude and collision with the water before either crewmember realized anything was amiss," the investigation flight surgeon theorizes.

"The most likely cause of the accident, considering the paucity of information available, would seem to be spatial disorientation and/or true vertigo subsequent to rapid shift from more or less VFR to IFR conditions while turning.

"The possibility of true vertigo secondary to Coriolis acceleration is a very real one.* The aircraft were in a gentle turn at the time the cloud was entered. Rapid turning of the head in an attempt to maintain clearance from the other aircraft in formation could well have caused an episode of true vertigo. Transient disorientation or vertigo, a misread instrument, a moment's hesitation could have sent the aircraft into the water from its low altitude before either pilot or RIO realized that anything was amiss.

"*Recommendations*:

"Emphasize more frequently in appropriate phases of training and pertinent publications the need to rely on aircraft instruments, not bodily sensations, while flying IFR.

"Pilots should be taught the difference between spatial disorientation and true vertigo. The Coriolis effect should be explained with special emphasis on the necessity to keep the head as immobile as possible when turning an aircraft under IFR conditions."

*The so-called Coriolis effect results when your body is in rotation with the aircraft and you move your head out of the plane of rotation—especially at a right angle to the plane of rotation. (For more on vertigo and the Coriolis effect, see last month's APPROACH, Headmouse, p. 22.)

NOTES from your FLIGHT SURGEON

Delayed Ejection

JUST after the break for landing, a QF-9G in the no. 2 position flamed out at 1200 feet. The pilot tried three relights unsuccessfully. (*The NATOPS handbook for the TF-9J states a relight should not be attempted under 1500 feet and 250 knots.*)

"Seeing my altitude of 2700 MSL or 500 AGL," the pilot says, "I decided to eject." He positioned himself, gave a quick flameout call and "rapidly pulled the curtain."

Ejection forces were strong, but after about a tumble and a half, he was yanked downward as his parachute opened.

"Looking around, I checked my position, noticed with surprise how close I was to the ground and prepared for landing as I had been taught—hands on the risers, eyes straight ahead, legs together and bent slightly. On impact I rolled and immediately released my right riser and stood up to wave at circling aircraft that I was OK."

He then released the left harness release after dumping his billowing chute.

"Very shortly thereafter, my landing area became quite populated and I was returned to the airfield."

The pilot concludes his narrative with some interesting remarks: "This QF-9G was the only aircraft of its type on station with (this particular) ejection seat aboard. This fact undoubtedly influenced my decision to attempt relights. The ejection envelope limits, though often proven and designed to instill confidence in pilots, *should not be pushed*. This fact is more quickly realized while sitting comfortably on the ground and reviewing the above events."

Prop Injury

IN a recent incident, a man came into contact with the rotating propeller of an EA-1F following a night recovery. The man, who fortunately received only minor injuries, briefed the committee on the circumstances of his encounter. Significant aspects are that this man neither heard nor saw the propeller until he felt it hit his arm. The pilot was also unaware of the incident.

Being an experienced flight deck worker does not provide immunity from danger. This man is a second class petty officer who briefs newer men on flight deck safety. It is felt that propeller danger may frequently be ignored on the CVA carriers where jet aircraft assume the major role.

—FORRESTAL *Safety Council*

Leg Garters

AN F-8 pilot who ejected had an unauthorized modification to his leg restraint garters. They were cut and the metal rings were sewn to the legs of his anti-G suit. "This proved unsatisfactory," the accident report states, "in that . . . his left leg (dangled) out to the side during the ejection." The lower left garter had torn loose from the anti-G suit and the zipper stitching on the lower left leg ripped.

"It is recommended that the leg restraint garters be worn as they were designed," the investigating flight surgeon recommends. "If for convenience they are tacked to the anti-G suit, they should be buckled around the leg in the prescribed manner. Modifications or alterations of them in any way which might compromise their function could result in needless injury or non-survival of the person involved."

Modifications or changes of flight equipment without BuWeps approval are not authorized. (For a discussion of this, see *Personal/Survival Equipment Crossfeed 1-64.*) Assemblies and components affecting safety of flight shall not be incorporated in operational aircraft without appropriate tests and acceptance by the government of the results.

Missed Meals

COMMENTING on a landing accident aboard ship, the investigating flight surgeon noted that it occurred 20 hours after the pilot's last meal. He did not eat breakfast the morning of the accident and, because of operational commitments, he had been unable to eat lunch.

The flight surgeon lists the pilot's missed meals as a contributing cause of the accident.

"The need for proper nutrition provided by well-balanced meals at reasonable intervals," he states, "should be stressed to pilots, their commanding officers and personnel concerned with the preparation and serving of food. Carrier aviation is too stressful and exacting a skill to be undertaken in a state of less than optimum physical and mental preparedness."

A lot of mishaps putting aircraft into the boonies result only in minor damage—but, when the salvage crew is through—the damage is major. Successful salvage operations depend on sound procedures and observance of certain precautions. So here are a few tips on

LIFTING AIRCRAFT WITH F

It is difficult to make any specific recommendations for removing crashed or encumbered aircraft because there are so many variables to be considered: 1) extent of damage to aircraft, whether it is a flat tire or a near loss; 2) weather conditions, which may involve rain, snow, sleet, or high winds; 3) terrain conditions—aircraft may have come to rest in swamp, mud, snow, on rough ground, or in a hilly area; 4) availability of tools and equipment, and/or access of reclamation vehicles to the crash site.

Because of this, it is possible to make only a few general recommendations. Some of the more important of these are:

- Defueling to reduce weight and minimize fire hazard;
- Removal of baggage and cargo to reduce weight and to minimize further structural damage in case it becomes necessary to drag the aircraft from, or onto, the runway;
- Maintaining center-of-gravity limits; and
- Special precautions in mooring.

Jacks for lifting damaged aircraft are not always a satisfactory method, because it may be difficult or impossible to construct a suitable base for a jack of the required capacity, or, jacks with a low-collapsed height and adequate lift and capacity are not available. Lifting a belly-landed aircraft, for example, would require a low jack with a high lift. A high lift under some situations could contribute to an already unstable condition. Yet with successive cribbing, jacks prove a successful—however slow—way of raising aircraft.

Lifting bags provide a means of raising, in a minimum amount of time, an airplane that has made a gear-up landing; or has landed on soft or irregular

terrain, where the use of mechanical lifting equipment is impractical. Since it is not feasible to establish fixed procedures to apply to every incident, the success of the lifting operation will depend upon sound judgment and planning, combined with a little ingenuity and common sense.

Know Structure and Equipment

It is important that persons engaged in the lifting operation be familiar with the aircraft structure and its limitations, and the lifting equipment.

Each pneumatic lifting bag set, FSN R-1700-CO3-1607-5030, contains the following items: six bags, each with a six-foot lift and a capacity of 12 tons; two portable gas engine-driven air blowers with a capacity of 50 cfm at 5 psi; *(some units employ two 50-lb., CO_2 bottles)* six one-inch (ID) air hoses of 50-foot lengths, of the fuel jettison type with steel reinforcing wire; six pieces of felt, 6½ feet by 7½ feet and one-inch thick. *(Allowance lists for stations supporting larger aircraft call for 8 bags. Ed.)*

Each lifting bag provides a six-foot lift. When more than six feet of height is required, two bags may be stacked and laced together. Two stacked bags give a total lift of 12 feet. When bags are used in this manner, additional mooring precautions are required to preclude shifting of the aircraft, or cribbing may be built around the bags to prevent shifting under load. As many as three bags may be manifolded to one blower.

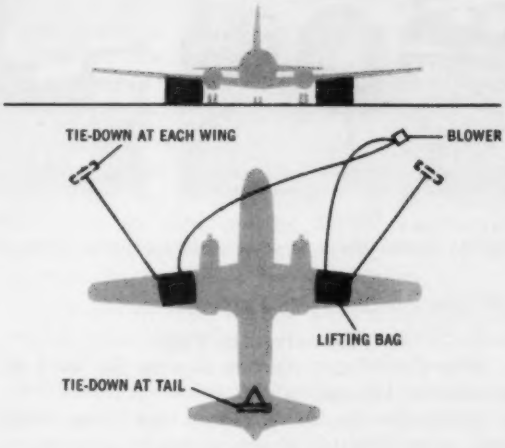


Figure 1. Typical lifting bag locations.

PNEUMATIC BAGS

After carefully studying the position of the aircraft, determining the structural condition, and ascertaining the approximate center of gravity, it will be necessary to decide how many lifting bags will be required and the most feasible location, for the bags. The number and position of bags, again, will depend on airplane attitude, structural condition, and terrain.

In evaluating the structural condition, it should be determined if impact loads have been transmitted to other major parts of the aircraft. If they have been transmitted to the wing, for example, location of the lifting bags may vary from the standard shown in figure 1. The placement should be determined by the area available, the load which the structure

Continued

Figure 2.
Position of nose after nose gear collapse.

Figure 3.
Position of tail after nose gear collapse.

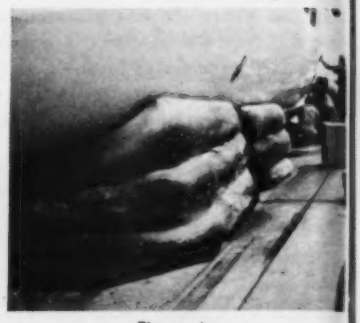


Figure 4.
Position of pneumatic bags under fuselage.

will take, and the bearing area of the bag.

Locating the Bags

After determining the best location for the bags, proceed as follows:

1. Remove any sharp objects from area where bags are to be placed so as to eliminate puncturing or otherwise damaging bags. If it is impractical to remove embedded rocks or sharp objects, the area may be covered with plywood or planking to protect the bags. It is wise also to clear any area nearby to preclude damage to the bags in the event the aircraft shifts during the lifting operation.

2. Remove bags from tarpaulin cover, and use cover as a protective base for the bag.

3. Position bag(s) under the wing, and/or fuselage, as shown. If bags are used under the wing, they should be centrally located so that the load will be applied between the front and rear spars, thus precluding overloading the secondary wing structure. If bags are required under the fuselage, they should be stacked in locations that will distribute the load along the length of the fuselage. Bags should not be positioned under the area of the nose and/or main landing gears (in a wheels-up configuration). With bags in these areas, it will be impossible to lower the gear after the aircraft has been raised sufficiently to permit gear extension. Structural jack points should also be kept clear.

4. Check undersurface of the wing and fuselage. If sharpness or roughness is found, cover top of bag with pad provided in the kit. Remove or pad the fuel drain lines and other protrusions that may be damaged, or that may cause damage to the bag.

5. Securely fasten the two outlet sleeves of the inflation bag. The word "OUTLET" is stencilled directly below each of the sleeves. Two fabric straps with buckles are provided.

6. Attach hose securely to the inlet connection of the bag and to the outlet connection of the blower. These connections are one-inch pipe-threaded fittings. The inlet connection of the bag has the word "INLET" stencilled directly above it.

Note: When locating the bags, be sure the inlet valve on the bag is nearest the air supply.

Check Security of Mooring

Before starting the blower, determine that mooring lines are securely anchored so that there is no possibility of the airplane sliding or tilting as it is being lifted. Mooring in the wide open spaces can be a problem; however, trees or other natural objects many be utilized as anchor points. If lines are tied to vehicles, wheels of vehicle should be securely chocked, in addition to setting brakes, so that mooring will be as firm as possible. A heavy airplane, if it gets out of hand, can drag a large tractor.

Under some conditions of sloping terrain, the change in CG during lifting must be taken into consideration. On uneven terrain, where an attempt is being made to level the airplane laterally, it is important that the aircraft be lifted in such a way that no further damage is incurred.

For example, if the airplane has landed in a tilted position with the right wing resting on an embankment, it may be necessary to raise the aircraft in the tilted position until the right wing can clear the bank, before attempting to level the airplane laterally. Raising the aircraft under these conditions is a particularly hazardous undertaking, and will require the use of slings or belly bands around the fuselage to prevent the aircraft from sliding; and a block and tackle to adjust the mooring lines to keep them taut during the lifting operation.

Even on the level ground, when pneumatic bags are to be used for lifting, the aircraft should be

adequately moored with block and tackle. There may be a few exceptions—one of these is covered later in this discussion.

Mooring lines may be of Manila line with a 3000-lb. pull test, or ¼-inch aircraft cables with a clevis at each end. On most aircraft, mooring points are at the fuselage tail skid and at the nose and main landing gears.

When the airplane is securely moored, the blower can be started. The blower is rated at 5 psi and 50 cfm.

Maintain Level Attitude

Where terrain or airplane attitude permits, lifting bags should be inflated simultaneously so that the airplane will maintain a level attitude during lifting, thus precluding shifting.

Caution: If bags are not being inflated evenly, stop the blowers and determine cause. This is an indication that the airplane is beginning to shift, or that the bags are improperly positioned.

Follow progress of the inflation with shoring, if possible, to prevent damage if a bag should blow out. Shoring should be padded to prevent damage to the aircraft skin.

When sufficient height has been reached, jacks, additional shoring, or crash dollies can be placed under the aircraft, and the bags removed. In some instances, when the airplane has cleared the ground sufficiently, the landing gear can be locked in position and thus support the aircraft.

After installing jacks or other supporting equipment, bags should be completely deflated and carefully packed.

Figures 2 and 3 show position of a Convair 880 after a nose gear collapse with aircraft in static condition. Note height of tail from ground. Sand bags were placed in the aft baggage compartment to redistribute the load. With sand bags installed and the aircraft stabilized, lifting bags are laid out in preparation for the lifting operation.

Bags were required only under the fuselage at stations 432 and 489. Figure 4 shows position of the bags which are partially inflated. In this instance, there was no wind and the aircraft was laterally stabilized by the main gear; thus, there was no need to moor the aircraft to prevent shifting.

In a pod or belly landing on comparatively flat terrain, bags under the wings can be used effectively to raise the aircraft enough to permit location of additional bags under the fuselage. Bags under the fuselage will help to stabilize the aircraft during the subsequent lifting operation. In this event, bags should be progressively distributed along the length of the fuselage as clearance permits. These bags should be inflated cautiously to preclude a high bending movement.

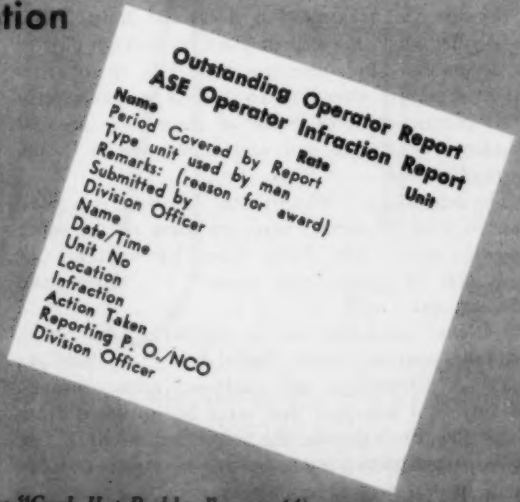
The applicable maintenance manuals give principal clearances that may be pertinent to the lifting operations—*Convair Traveler*.

ASE Safety Promotion

Do you experience difficulty in motivating the Aviation Support Equipment (ASE) operators? If so, you may initiate a reporting system similar to the one suggested here as a partial remedy to the situation. This system not only reprimands an offender but also praises operators for outstanding work. It is believed that a system such as this would be of value to the overall ASE safety program.

Suggested by LESHER, AM1 of NAS Corpus Christi while attending ASE instructor/operator training at Naval Air Maintenance Training Detachment 3039.

— C. E. Colee, AMHCA, NAMTraDet 3039



(See "Curb Hot Rodders" page 44)

While this article mainly concerns operators of the UH-2A/B helicopter, it applies to some degree to operators of any turbine-powered aircraft.

FOD INSPECTION TOOLS

With the advent of the turbine power helicopter, there emerged the danger of foreign object damage. FOD has become an awesome reality in the form of dollar statistics and maintenance man-hours.

The UH-2A/B has a FOD problem all its own. In particular the transmission deck and hoist boom area offers an excellent place for foreign objects to accumulate. Foreign objects accumulated in such areas can easily find their way into the engine during turn-up or flight. Because of the design of the UH-2A/B (in particular the location of the engine and inlet), there are three possible methods of foreign object ingestion:

(1) through the air inlet scoop screen,

(2) through an open inlet duct blow-in door,

(3) through a gap between the inlet duct and the engine bellmouth.

Because the transmission deck and hoist boom areas offer such an excellent place for foreign objects to accumulate, the inspector must give these areas his most careful attention. To do this he uses certain FOD prevention tools. Some of these tools are old standbys; others are new and homemade to fit the particular need.

The best tool a FOD inspector can have is a good pair of eyes. However, here are some of the other valuable aids to him. Photo shows, left to right, (1) flashlight, (2) pliers, (3) scraper, (4) mirror and (5) magnet.

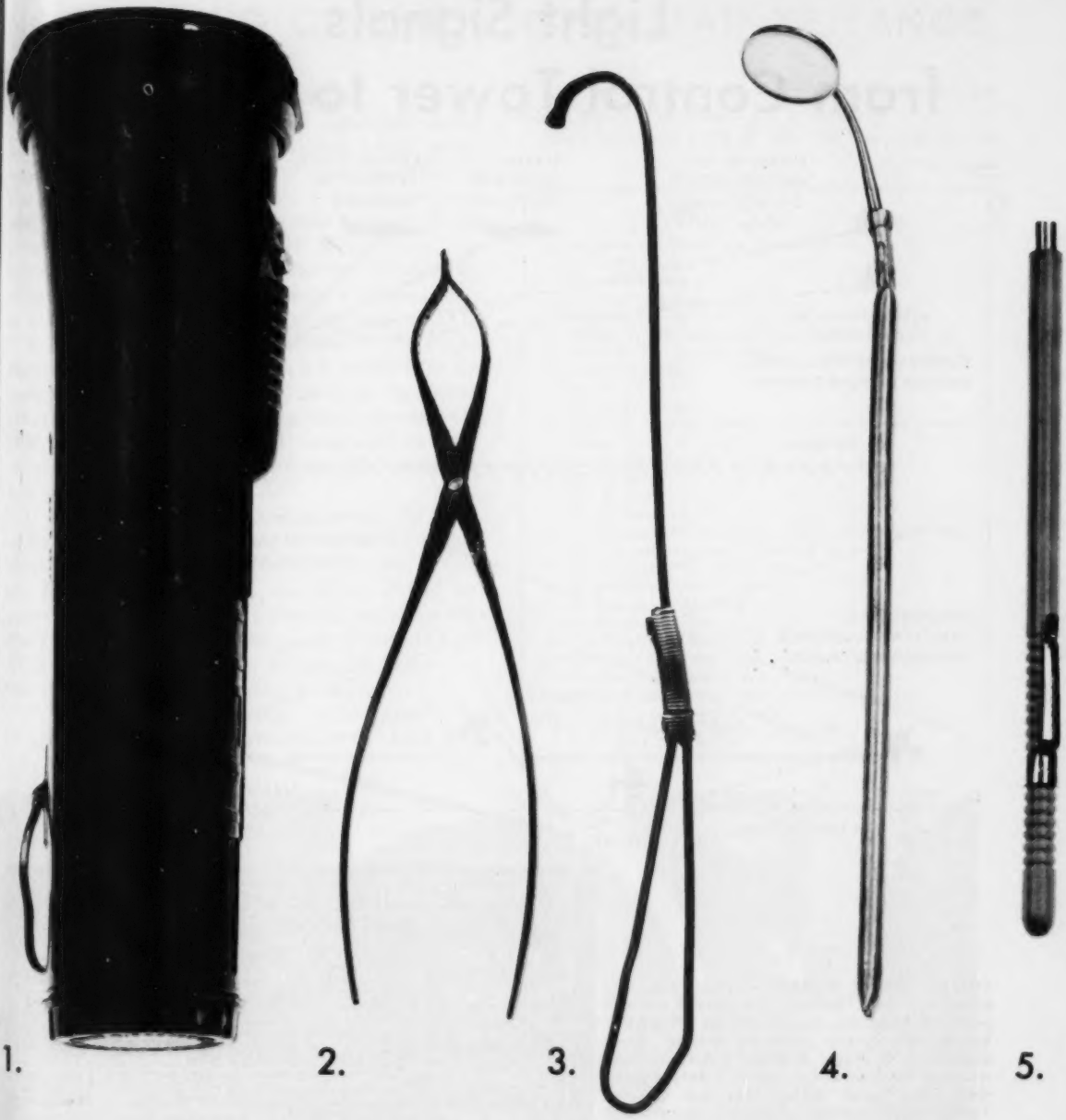
Flashlight—Inspectors use a standard Navy issue, two-cell, narrow beam flashlight. The flashlight beam is directed on all shadowed areas, corners, pockets, and any spot that must be inspected from a distance. For example, the power turbine wheel can be inspected by two methods. One method is to move the light in a sweeping motion starting at a particular point and coming back to that point. Another method is to direct the light at a particular point and spin the power turbine wheel. Laying the light close to surfaces and shining beam parallel to surface will sometimes show an object by causing it to cast a shadow. The flashlight is necessary for the discovery of FOD and must be used.

Pliers—The pliers are a light, homemade gripping device approximately seven inches long. It has a long curved snout ending in two flat tips which fit flush together. This tool is used in areas inaccessible to the fingers, and on objects which can't be picked up by the fingers. The plier provide a positive grip on both ferrous and nonferrous material. Objects can be firmly held until removed from the area. The pliers are a handy tool with a definite use in FOD control.

Scraper—The scraper is a hook-shaped, homemade wire scraper approximately eight inches long. It has a flat tip and a shaped handle. The scraper is used in any nook, crevice, or pocket that another tool won't operate in. Foreign objects can be scraped, hooked, or otherwise moved to a position accessible to the hands or gripping tool. This is one of the most useful of all FOD prevention tools.

Mirror—The mirror is simply a standard dental mirror adapted for use in FOD inspections. It is used to inspect areas out of line of sight. By placing the mirror behind the obstruction and at the proper angle, foreign objects can be brought into view. The mirror is used least of all the FOD prevention tools, but it can be very helpful in certain instances.

Magnet—The pencil magnet is approximately seven inches long, with a pocket clip at one end and a small magnet at the other. By probing in corners, nooks, and pockets, the pencil magnet will pick up all ferrous objects. It is one of the handiest tools for use in discovery of foreign objects. Even though the pen-

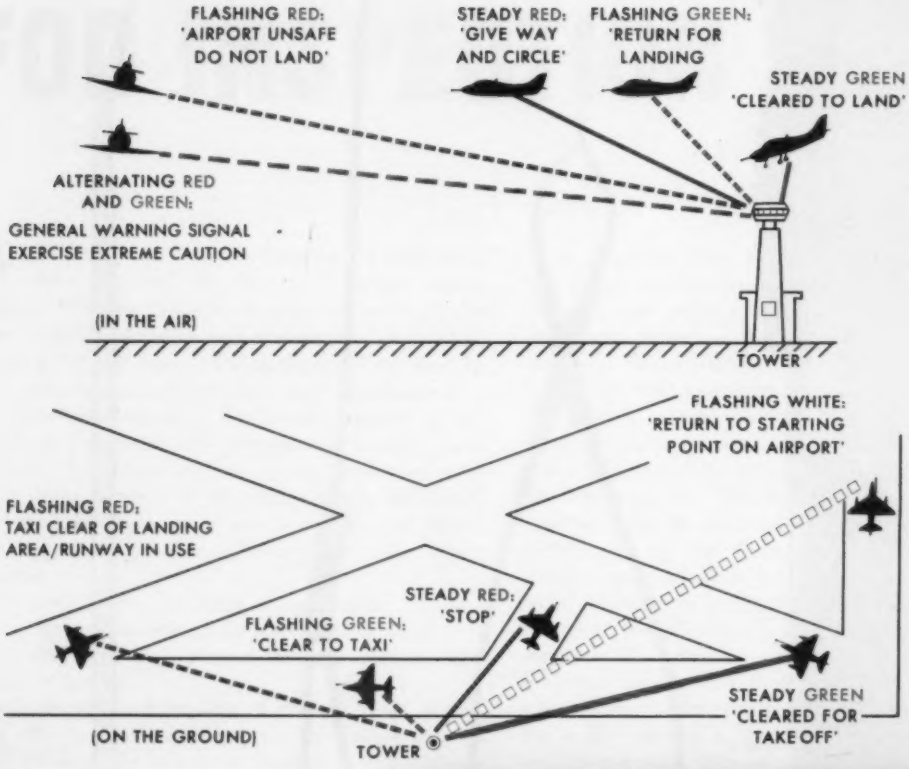


1. 2. 3. 4. 5.

cil magnet is limited to ferrous objects, it accounts for the majority of foreign objects removed from an aircraft.

Each inspector at HU-2 makes his own FOD prevention tools and takes care of them. Each man is proud of his work and the part he plays in FOD control. A man who takes pride in such a simple thing as fashioning a tool will take pride in his work. A man who takes pride in his work does a good job. That's what we need.—*LTJG S. M. Matyas, FOD Control Officer, HU-2*

Light Signals from Control Tower to Aircraft



TOWER SIGNALS FOR CONTROL OF AIRCRAFT		
COLOR AND TYPE OF SIGNAL	AIRCRAFT ON THE GROUND	AIRCRAFT IN FLIGHT
STEADY GREEN	CLEARED FOR TAKEOFF	CLEARED TO LAND
FLASHING GREEN	CLEARED TO TAXI	RETURN FOR LANDING (TO BE FOLLOWED BY STEADY GREEN AT PROPER TIME)
STEADY RED	STOP	GIVE WAY TO OTHER AIRCRAFT AND CONTINUE CIRCLING
FLASHING RED	TAXI CLEAR OF LANDING AREA/RUNWAY IN USE	DO NOT LAND
FLASHING WHITE ■ ■ ■ ■	RETURN TO STARTING POINT ON AIRPORT	— — — — — — — —
ALTERNATING RED & GREEN	GENERAL WARNING SIGNAL EXERCISE EXTREME CAUTION	
LOOK BOTH WAYS — EVEN WHEN CLEARED TAXI SAFE — FLY SAFE AVIATION SAFETY HAS NO QUITTING TIME		
OpNav 3722-24A Ref: ATP 7110.1B NASC 4-65		

TOWER SIGNAL DECALS—Actual size, depicted at right, suitable for posting in aircraft cockpits are now available at NASC. Safety officers can order by writing: Commander, U. S. Naval Aviation Safety Center, Norfolk, Virginia 23511, Attn: Safety Education Department. Note: Standard Control Tower Light Signals to Vehicle decals are also available.

NOTES AND COMMENTS ON MAINTENANCE

Arming Checklists

MOST arming checklists are apparently based on the assumption that all switches which might enable the dropping or firing of stores are OFF as one starts through the list. This is not always so—and may result in the inadvertent arming of the system long before it is desired. While going over the remainder of the list, the pilot may accidentally strike the release switch and cause a release, since in his own mind he still considers the system SAFE.

A review of the checklists in the SP-2H Flight Manual shows that in *every case* it is possible for the system to be completely armed early in the checklist. Less than half of the lists provided any clear-cut HOLD point, and none was so designated. In most cases, "Master Armament Switch—ON" was the first or second item on the list.

It appears that the ideal checklist should have as its first item the positioning of the Master Armament Switch to OFF. Later, as the last step before the final release sequence, the switch should be placed ON. This provides a clear-cut point on the checklist at which the system passes from SAFE to ARMED. The checklist can be completed down to this item, holding final arming as desired.

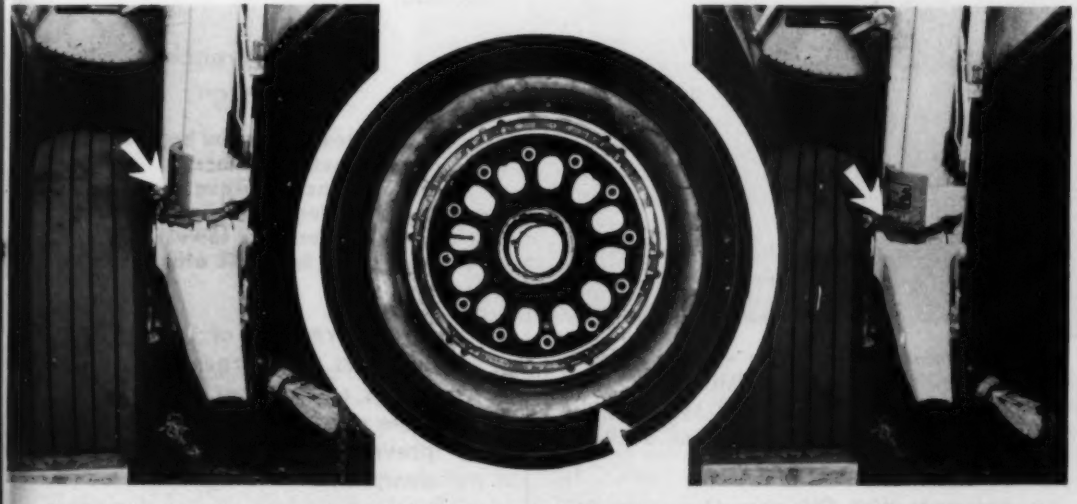
This relatively simple concept in the preparation of an ideal checklist is submitted in the hope that it may be of use to other operators of aircraft for which various checklists are a necessity.

—Contributed by CDR W. W. Mc Cue, CO, Patrol Squadron 21

Whiz Quiz

1. Aviation gasolines are graded according to
   a. Color
   b. Octane rating
   c. Vapor pressure
   d. Lead content
2. What type of hydraulic fluid is used in naval aircraft at the present time?
   a. Mil-H-5606A
   b. Mil-C-2639
   c. Skydrol 500A
3. Suitable ramp or parking area static ground points should have resistance no greater than
   a. 1.0 Ohm
   b. 1.0 Amp
   c. 1.0 Volt
   d. 1.0 Milliamp
4. The danger of fire due to static electricity during fueling operations is controlled by
   a. grounding the fueling hose
   b. grounding the aircraft
   c. grounding the truck
   d. all of the above
5. The two fundamentals of safety are
   a. keep away from props and look for danger
   b. always be careful and alert
   c. use good common sense and know your job
   d. study and practice safety

For the correct answers see page 44.



Mispositioned Main Mount Ground Safety Lock is indicated by arrow in photo at far right caused scoring of tire wall (center). Correctly positioned lock on S-2 main mount is shown in left photo.— ***LT P. D. Robbins, ASO, VS-27***

Spline Lubrication

SOME engine-driven accessories receive spline lubrication from internal engine oil and some do not. The "dry" accessory drive splines are those splines which do not receive engine oil lubrication but instead, are lubricated at installation with Plastilube No. 3 lubricant.

A word of caution is in order regarding the indiscriminate use of Plastilube No. 3 on "wet" splines which normally receive lubrication from the engine oil. Plastilube should never be applied to those drive splines which receive engine oil lubrication, since to do so may plug the small oil passages and restrict the normal flow of lubricating oil during service. .

—Delta Air Lines "Technical Review"

Compass Calibration Made Easy

A NEW calibration device which eliminates manually swinging the compass on a compass rose has been purchased by the Navy. The device, called the MC-2 Magnetic Calibrator set requires that the aircraft be positioned only once, along a north-south line. Time and manpower required to rotate the aircraft each time it is necessary to make a check in another direction is saved in addition to decreasing the possibility of either not detecting errors or introducing errors that would affect the aircraft compass system.

The MC-2 supplies signals causing an electromagnetic field (generated in its flux valve) which is identical with the earth's field. Rotation of the field causes the same effect as would actual rotation of the aircraft. Therefore, compass system errors are measured as the difference between the aircraft's magnetic heading (shown by the compass indicator) and the heading of the electromagnetic field.

The site for compass calibration should conform to standards set forth in Mil-Std-765 of April 1962, *Compass Swinging, Aircraft, General Requirements for*. In most areas a site has been previously established for this purpose, but should this not be the case, the Military Standard lists the needed requirements.

It is recommended those of you who may be concerned with the operation of the MC-2 read April 1965 issue of "Digest of U. S. Naval Aviation Electronics," NavWeps 08-1-503, for complete details.

Answers to Whiz Quiz page 43

1. b, 2. a, 3. a, 4. d, 5. c.

Curb the Hot Rodders

WIDE open spaces between the line and hangar apparently tempts operators to hot rod their steeds. The result has been a number of accidents involving line support equipment. More insidious and almost as serious is the greatly accelerated wear on expensive and hard to replace vehicles.

The most effective way to combat this situation is through the exercise of leadership responsibility by officers and petty officers. If an NC-5, for example, races by an officer or petty officer and the driver is not called down, he will assume that such practices are acceptable to the command and the stage for an accident will have been set.

On the other hand, if improper vehicle operation is corrected whenever it is observed, the word will get around and the line area will become a safer place.

Be a leader, do your duty and you'll get more service out of your equipment.—*Adapted from UTRON TEN's "Crosswind."*

(*See ASE Operator's Reports page 39*)

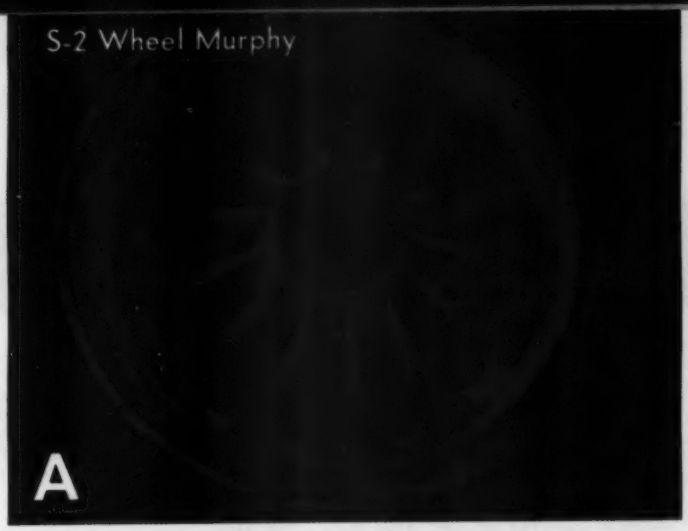
Tool Rules

Use the right tool for the job.
Use the tool correctly.
Use tools that are in good condition.
Account for all tools after every job.
Stow tools properly in tool boxes or racks.
Take care of your tools—prevent injury and FOD.

Torque Wrench "DON'TS"

. . use an extension on the handle end.
. . use to loosen fasteners.
. . exceed wrench's torque capacity.
. . change setting with handle locked.
. . store at other than lowest setting.
. . store in tool box with other tools.

The prevention of aircraft incidents and ground accidents should receive the same strenuous efforts as the prevention of flight accidents. . . .



A. Bolts, PN 152985 installed backwards

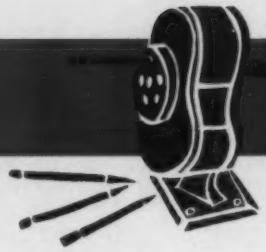
MURPHY'S LAW

If an aircraft part can be installed incorrectly, someone will install it that way!

B. Bolts installed correctly

During a cross-country flight in an S-2E the pilot landed at an enroute base. During preflight prior to departure a worn tire was noted and a tire change requested. After installation of the replacement tire and wheel assembly inspection revealed the bolts were installed backwards (photo A). Photo B shows bolts, PN 152985, correctly installed.

With the nut and bolt combination installed incorrectly, the possibility of the nuts loosening and backing off is increased because of the reduced bearing surface for the nuts as well as the bolt heads. If a wheel failure does not occur, such loosening can cause damage to the brake assembly.—*Contributed by LT. P. D. Robbins, VS-27.*



LETTERS

Beware Stateside Wires

Norfolk, Va.—The attached letter to the editor appeared in the *Army Aviation Digest*. It might also be of interest to your Marine and Navy carrier chopper pilots returning from Far Eastern duty.

MAJOR F. E. STEWART
U. S ARMY LIAISON OFFICER
WITH NASC

• Thanks for the thought. The letter says:

"Are wires a major flight hazard in Viet Nam? No, but here at Fort Benning, especially in the many off-post maneuver areas, they are!

"After a year's flying in the land of rice paddies and jungle-covered mountains, one is liable to forget all about wires and concentrate solely on a landing zone. Wires are practically non-existent in the "Old Country"; therefore, they are only a minor consideration.

"I speak with experience because I have recently returned from Viet Nam. After reporting to my unit, I was assigned to pick up six passengers for the purpose of making a recon of a proposed off-post maneuver area. After finding the area, the party wanted to land and make a recon from the ground in order to find a possible location for CP headquarters, a mess hall, etc.

"I was so preoccupied with trying to do a good confined area approach that I practically landed right on top of four wires. I cut one wire and saw the others in time to stop the helicopter before I cut the other three.

"Needless to say, the crew and passengers were 'shook-up,' and there was one less wire stretching across the beautiful countryside. There was no damage to the crew, passengers or aircraft, but the incident could have resulted in the loss of nine people, one chopper, four wires and possibly a few trees.

"This is just one more reminder on a seemingly endless subject, but I for one will try to remember the following points of a low recon:

Forced Landing Areas,
Ground Conditions, Slope,
Hazards,
Obstacles In Landing Zone,
Entry and Takeoff Patterns . . ."

LT James N. Lynch
11th Air Assault Division
Ft Benning, Ga.

• Your report was forwarded to the decision-makers in BuWeps.

It may help them in their evaluation and at the same time bolster the confidence of other F-4B operators in the event the 26-week cycle becomes a reality. Headmouse concurs in the warning—Beware when changing cycles—this isn't the first one to slip through.

Now It Can Be Told

NAS Unknown—Since BuWeps is considering a 26-week F-4B check cycle (present cycle, 20 weeks) we can tell this story. First, we want to warn all mousers—BEWARE when changing check cycles that reshuffling does not let one slip through. Granted, it sounds impossible but a smooth running outfit managed to pull this one off!

One F-4B has completed a 27-week check cycle. For the general benefit of other F-4B outfits here briefly was that aircraft's condition:

Power Plants (J-79)—Outstanding. Externally and internally corrosion was at a minimum. No combustion liner replacement was necessary (Power Plant Change 5, Rev. A was incorporated). Evidently the new liners are proving completely satisfactory. Accessories, filters and strainers were in excellent condition. Both engines exceeded 225 hours (present limit is 180 hours).

Airframe and Electronics—Good condition—no apparent problems due to check extension.

CHECKMOUSE

APPROACH welcomes letters from its readers. All letters should be signed though names will be withheld on request. Address: APPROACH Editor, U. S. Naval Aviation Safety Center, NAS Norfolk, Va. Views expressed are those of the writers and do not imply endorsement by the U. S. Naval Aviation Safety Center.

Fly Like You Drive?

FPO, New York—Probably not, and many squadrons have the records to prove it. For seven consecutive years now Patrol Squadron 21 has had an unblemished aviation safety record. How about their performance on the highways? Quite another story—unfortunately.

During the last four years the personnel of this squadron have been smashing up cars at the rate of 13 per year resulting in one fatality and at least 50 injuries. Why the big difference in safety records? The same people are driving the cars who are flying and maintaining the aircraft so the answer must be somewhere else. *Technique* and *mental* attitude? Probably so!

For instance, would you consider launching in an aircraft after downing three or four beers? Certainly not! But how many of us think twice about driving home after Happy Hour? And chances are you left more than three or four empty glasses on the bar. Or, would you takeoff without strapping in? That seat belt and shoulder harness are an integral part of your aircraft equipment and undoubtedly locking it is a part of your pre-takeoff checklist. Do you have seat belts in your car? Many of us do today, whether forced by state law or conscience, but how often do we forget to buckle up?

How about this one—would you enter the holding pattern at twice normal cruise speed? No, then why spin off the expressway at twice the posted exit speed? Or this one—none of us would takeoff without clearance so why zip out of the parking lot into oncoming traffic? Or worse yet, why jump a stop

sign? Have you ever thought of the consequences of passing on a hill? It's just about as safe as overrunning the formation leader.

It doesn't take long to find the answer to safe driving. Let's think safe. Put some of these aviation safety rules into practice on the highway and we'll live longer.

VP-21

• **APPROACH doesn't normally print auto safety material—but this letter crossed the desk at the same time as a DOD release reporting that 1514 servicemen were killed and almost 15,000 injured last year as the result of accidents involving private motor vehicles.**

Whether the accident is aircraft, automobile, sports, weapons-handling, machinery, or industrial both you and the Navy's readiness suffer from death and disability.

It's The Little Things

Phoenix, Arizona—The nature of aviation safety is such that those of us who work with it daily often become frustrated and discouraged when the things we work hardest at never seem to come to fruition. The multitude of little things that we take care of in the daily routine we tend to dismiss as "spinning of wheels" or "not important" because the big problems aren't being solved fast enough.

In our business of crash survival safety we often tend to become frustrated and discouraged with the desire to solve all of the problems we know to exist ASAP. But we are inspired on these occasions by the words of an associate who is one of the giants in the safety field—Mr. I. Irving Pinkel of the NASA Lewis Research Laboratory in Cleveland. Perhaps Mr. Pinkel's comment would be of interest to other APPROACH readers:

Education is what you get when you read the fine print . . .
Experience is what you get when you don't.
—ANON

"Every industry is obliged to improve its safety record where it can. Those who insist on ignoring the smaller safety problems about which something can be done, pointing to the larger problems about which nothing can be done yet, are mostly evading the issue. Most safety measures adopted by an industry deal with small portions of the total hazard. Over the years the steady improvement that results is significant. If each step is discouraged because it doesn't solve the whole problem then nothing is accomplished."

HARRY G. C. HENNEBERGER
AVIATION SAFETY ENGINEERING
& RESEARCH DIVISION (FSF)

Spark Pilot Study

FPO San Francisco—Considering the rapid advances currently being made in aviation, both military and civil, and the mountainous accumulation of literature and publications necessary to keep personnel abreast of the situation, pilots are frequently tempted to relax old NATOPS and Handbook study habits in order to spend more time on the avalanche of paperwork crossing their desks. As accident statistics prove, however, any lapse of study in the area of NATOPS and emergency procedures can bring about catastrophic results under conditions in which a thorough and current knowledge of the correct procedures is mandatory.

In order to promote continued study and familiarization of the Flight Manual and NATOPS Manual by our aviators, this command utilizes a weekly Pilot's Safety Quiz, published by the Aviation Safety Officer and distributed at our weekly pilots' meetings. The quizzes cover material from the Flight Manual, NATOPS Manual, OpNavInst 3710.7B, and the local Air Operations Manual. We feel that this short quiz has been of great value in maintaining a pilot study program for all aviators in this squadron.

Although many other commands undoubtedly utilize a similar gimmick to keep their pilots "in the books," this technique may be helpful to those ASOs who are looking for a new way to spark interest in pilot study.

F. H. WOOD, LCDR
ASO, VP-17

• **Many thanks for reminding us that this technique does produce results.**

Oxygen—Oxygen—Oxygen

RNAS, Singapore—With reference to the article "The Insidious Enemy" APPROACH—pages 29, 30—Jan 1965), it astonishes me that none of the controllers involved in this tragic accident had the initiative to attempt to induce the pilot of the RA-3B to check his oxygen supply.

The Fleet Air Arm of the Royal Navy prepares for this particular eventuality by instructing all radio users in the action to take if they suspect that a pilot is suffering from hypoxia. They are constantly reminded of this by posters prominently displayed at radio operating positions in Air Traffic Control.

I firmly believe that the words "OXYGEN - OXYGEN - OXYGEN," spoken distinctly and with a sense of urgency over the R/T, have prevented numerous similar accidents in the Royal Navy.

In passing, I would like to commend you on an excellent Flight Safety magazine which is widely read by both Aircrew and Controllers in the Royal Navy (when we can get our hands on a copy!).

J. G. AXE, LT, RN
AIR TRAFFIC CONTROL OFFICER

• **Our goof. Printer left off "continued" slugline on page 29. Controller did try somewhat, as noted on page 30. Your prevention technique seems excellent.**

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Vol 11 **approach** No 2

Our product is safety, our process is education and our profit is measured in the preservation of lives and equipment and increased mission readiness.

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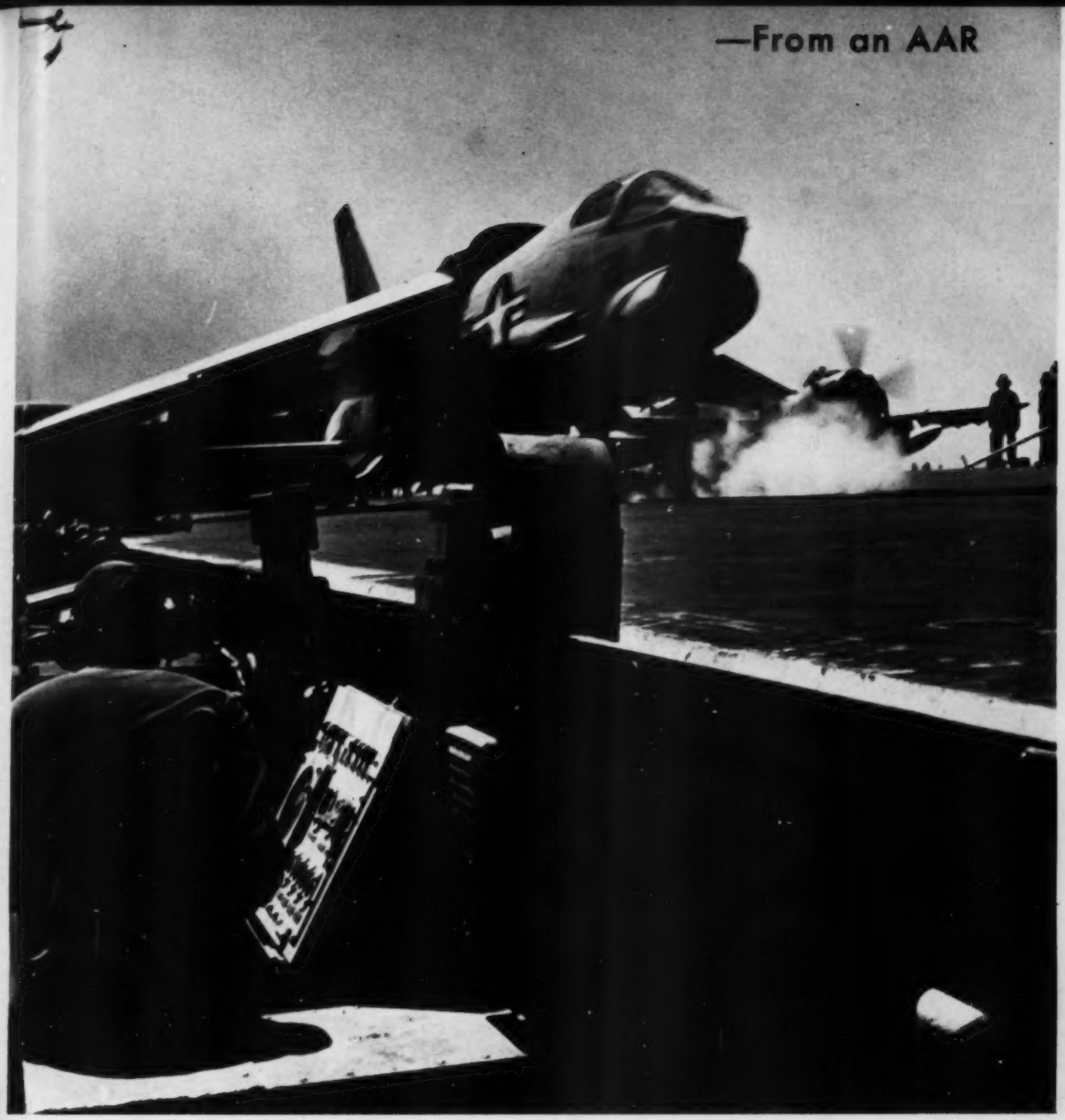

"The inherent dangers of the flight deck environment require that constant aggressive attention must be given to procedures to fit them to the prevailing conditions. This is the responsibility of all levels of supervision."

LIFT and DRAG

NAVY
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